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PERSONAL REMINISCENCES OF THE EVOLUTION OF SMALL-ARMS AND MACHINE GUNS FROM THE YEAR 1863 UP TO THE PRESENT DAY.

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Wednesday, June 29th, 1898.
Rear-Admiral the Rt. Hon. Lord CHARLES BERESFORD, C.B., M.P., in the Chair.

I.—RIFLES, ETC.

I MAKE the year 1863 the starting point for two reasons:—

1. Because it was just the close of the muzzle-loading period.

2. Because it was in that year that I became personally acquainted with the Service rifle, since which time I have continually kept up my acquaintance with the Service small-arms, making all kinds of experiments; and for the last sixteen years my duty has been to inspect and test the various arms during their manufacture, after they are finished before issue, and again when in use in the hands of the troops.

In the year 1863 the muzzle-loading long Enfield was, generally speaking, the Service rifle. The Navy, rifle battalions, and sergeants of infantry were armed with the short Enfield, and Royal Engineers with the Lancaster carbine, which had a smooth oval bore, firing the same bullet as the Enfield.

The Enfield rifle was designed at the Royal Small-Arms Factory, Enfield, and although the first pattern was dated 1853 it can hardly be said to have been finally adopted until 1855, when some of these rifles reached the army before Sebastopol, who had been previously armed with the Brown Bess and Minié rifle.

The calibre of the rifle was ·577, rifled in the three grooves, the twist of the rifling being one turn in 6 feet 6 inches, or about half a turn in the length of the barrel.

The bullet was ·568 inch in diameter and weighed 535 grains, and the charge of powder was 2½ drams for rifles and 2 drams for carbines.

The bullet loaded easily, and on firing was expanded into the grooves by a clay plug, the frustum of a cone inserted in the base. The bullet and powder were contained in a paper case; to load, the loose end of this was torn off, the powder poured into the barrel, then the case was reversed, the bullet inserted in the muzzle, the empty case broken off, and the bullet rammed down. We were always taught as boys to wet the bullet before putting into the rifle, I don't know why; but I remember the taste of the lubricant. The percussion cap was a curious-looking one, like a tall hat with the brim split into four parts; one of these parts was bigger and longer than the others; if you put this long part towards the front of the rifle you were safe, if you did not and the cap burst (which it very often did) minute pieces of copper were driven into the little finger of the left hand, and though you did not feel it much at the time the pain and irritation afterwards were considerable, and I carry the scars to this day on my little finger from this cause. I have heard since that one of the flanges of the cap being bigger than the rest must have been accidental, as they were intended to be the same size; but it certainly was the case with those we had. The cap was very strong, and it was a common game for boys when waiting about on the range to put the little paper cones in which the caps were done up on the muzzle of the rifle and then fire a cap, when the paper cone would be blown off to some distance. A sad event happened at one of our public schools about this time. The boys were waiting to shoot, when one of them took up a rifle, put on the little paper cone and a cap, saying to one of his comrades, "Let's have a shot at your hand"; he fired, but the rifle was loaded, the bullet passing between the fingers of the boy without hurting him, but hit another boy standing behind and killed him.

In 1863 and the three following years I shot for my school at Wimbledon. In those days there were only two military positions, standing at the short ranges and kneeling at the long. Some very wonderful standing shooting was done then, and I remember at Wimbledon one of the Ross's (I think Edward) backing himself to make a large majority of bull's-eyes standing at 200 yards, the bull's-eye being a 9-inch circle. I think, but am not quite sure, that it was 70 bull's-eyes in 100 shots, but I remember he won easily.

The match or small-bore rifle in those days was generally the Whitworth, which had a mechanically fitting hexagonal bullet. The position was prone; the back position did not become popular until some years after.

The match-shooting was a tremendous business. The rifle was carefully cleaned and wiped after each shot, the shooter having a case like a medicine chest, containing, amongst other things, a row of little glass bottles, each bottle containing a carefully weighed charge of powder.

Although the Enfield rifle had a low velocity, 1,240 feet, and very high trajectory, in class shooting one had to shoot up to 900 yards and off the knee. The conditions for marksmen were: Five shots at 650, 700, 800, and 900 yards, target was 12 feet long by 6 feet high, bull's-eye

4-foot circle. Bull counted two, rest of target one, and it was necessary to make seven points in the twenty shots. I remember well the first time I was a marksman as a boy I made three points at 650 and two at 700, missed all five at 800, so had to make two at 900 to get the badge. I never thought there was the least chance, but my first shot at that range was a bull, and I don't think any of the others hit the butt.

In those days you only fired one shot at a time, then retired to the rear to load, and waited for your turn again after the whole of the rest of the squad had fired a shot.

By the introduction of this rifle a very great stride was made, and accuracy of infantry fire at considerable ranges began to be looked for. After some experiments had been carried on with it, a very high authority declared it to be the most effective weapon ever placed in the hands of a soldier, and that its introduction and the teaching of dexterity in the management of it had effected a reform far greater in its bearing than any that had been made since the first introduction of fire-arms.

In 1860 another immense stride was made, as since that date all small-arms have been made strictly interchangeable; that is to say, the various component parts of a dozen rifles of the same pattern might be mixed together, and they could then be assembled easily into a dozen arms. I consider this one of the most important epochs in the evolution of our small-arms.

Up to this time we had merely toyed with breech-loaders, and that principally with regard to their use by cavalry. Carbines on Westly Richards', Sharp's, and Terry's systems were introduced to a limited extent.

The first military breech-loader I ever saw came in about this time, the Westly Richards' carbine. It was a half-and-half sort of thing; the bullet and powder (the latter contained in a thin case and attached to the bullet) were inserted into the breech, and it was fired with the ordinary cap. I don't remember if it shot well, but I recollect having a shot or two with one, and getting covered with grease from the cartridge.

In August, 1864, it was decided that steps should be taken to arm the British infantry with breech-loaders, and the first step was to find a system to which our stock of Enfields could be easily and cheaply converted. After the trials of various plans, among which was the Soper, to my mind a very excellent system, the Snider was adopted in 1866.

The conversion was carried out by cutting off a portion of the breech and fitting in its place a hinged block forming a movable breech. The nipple was of course done away with, and for the first time a cartridge carrying its own means of ignition introduced. All our stock of rifles and carbines were converted.

The barrels of the old Enfield were made of wrought iron, but when new Sniders were made steel was used; the old wrought-iron barrels were very good, and I cannot help thinking that the iron ore in those days was better than it is now; one thing is certain that the wood of which the old Snider stocks were made was better than any wood we get now. The Snider had a low velocity (1,240 feet) and had a high trajectory;

but it was in many ways a most serviceable weapon, and very fairly accurate up to 500 yards, in fact I have heard many good shots say that they preferred it to the Martini at 200 yards on account of the comfortable stock. The bullet was a very formidable one—it had a large hollow in the head, and on striking flesh opened out, inflicting a most ghastly wound, and its stopping power was undoubted, though I never heard any questions being raised about it as we have recently heard about the Dum Dum, and other stopping bullets. The cartridge left much to be desired, and if it got damp, the outside paper had a nasty habit of rucking up, and of course the cartridge could not then be got into the chamber.

Immediately after the approval of the Snider, which was really only a stop-gap, steps were taken to seek out the best pattern of breech-loading rifle for future manufacture; and in response to an advertisement from the Government a large number of different descriptions of arms were submitted; many of these were at once rejected, and finally, after exhaustive trials, the Martini-Henry (so called because it embodied the breech action of Martini, an Irish gunmaker, and the rifling of Mr. Henry, of Edinburgh) was introduced in 1871; this was a great stride; the diameter of the bore was reduced to ·45 inch, it was rifled with seven grooves, twist 1 in 22 inches; the cartridge was much improved, the charge was 85 grains powder, and 480 grains bullet, the velocity increased to 1,315 feet, and the trajectory lowered, consequently the accuracy of the rifle was much increased, and it was very fairly accurate up to 900 yards. But the great feature, to my mind, was the action; the first was not quite satisfactory in this respect, but improvements were made until finally the action of the Mark II. and Mark III. Martini-Henrys was, and for that matter in my opinion is, the best military breech-loading action in the world. It would stand an immense amount of rough usage and knocking about without getting out of order, and I have an interesting relic testifying to this fact. An attempt was made some years ago to blow up the White Tower at the Tower of London; the charge was placed in a dark corner of the armoury, and on exploding dug a little out of the wall, but shattered an immense amount of glass, and blew the adjacent Martini-Henry rifles all over the place. It was part of my duty then to visit the armoury at the Tower periodically, and I went there the day after the explosion; on going to the armoury I saw a rifle hanging from the ceiling—it had been driven straight up and the muzzle forced through the lath and plaster. I had it taken down and found it broken and bent in all directions, but although even the trigger and most of the lever have disappeared, the action is uninjured and will still work.

The Martini-Henry carbine had a special cartridge with a lighter bullet and reduced powder charge, and with this its ballistic qualities were not so good as the rifle; it would fire the rifle cartridge well, but then the kick was severe, and almost prohibitive. I can stand heavy recoil as well as most people, but after firing ten or a dozen rounds with this carbine and rifle cartridges my shoulder used to feel a bit stiff, and I can quite imagine it hurting a thin man a good deal.

The Martini-Henry was a good target rifle, and 100 points and over out of a possible 105 have been often made with it at 200, 500, and 600 yards, seven shots at each distance.

The principal match rifle of this period was the Metford, by different makers. It had the Metford rifling, a very heavy barrel, a heavier bullet than the Martini-Henry, and generally a slightly larger bore. The shooting made with these rifles, fitted with wind-gauge match-sights, and fired in the back position, was wonderful; and I think I am right in saying that at 800, 900, and 1,000 yards, with 15 shots at each range, as many as 220 points have been made out of a possible 225.

The Martini-Henry was an excellent servant, and remained practically the Service weapon until the year 1888; but during this time many experiments had been carried on at Enfield with small bores; some ·350 rifles were tried, and eventually a large number of ·4 bore rifles were made. These still retained the Martini action, with a longer lever to facilitate extraction; but they were never issued in their original form, and when a still smaller bore was decided on they were fitted with ·450 barrels, and known as Martini-Henry, Mark IV.

It also became necessary, in order to keep pace with European nations, to introduce a magazine in connection with the rifle, and this caused a radical change in the breech action of our rifle. A large number of designs were submitted, and tried, by various individuals to make a magazine which would be applicable to our dear Martini falling block action. It is needless to trouble you with a description of any of these, it suffices to say that none of them were found suitable, and it became evident that if we *must* have a magazine rifle it was necessary to make a fresh departure, and abandon the falling block for the bolt. Time will not admit of going into the comparative merits of the two systems; personally, I like the block action much the best, and I have never been convinced of the necessity of a magazine; but as this was considered a *sine quâ non*, a bolt had to be used, and after a large number of trials of various kinds the Lee bolt was introduced.

It was at first intended that whatever magazine rifle was adopted should retain the ·4 calibre, but in consideration of further experiments with smaller bores, and the introduction by Major Rubin, of the Swiss Army, of a hard-coated bullet, the question was re-opened. This kind of bullet got over the difficulties of "stripping" and "leading," which had hitherto interfered with the introduction of a smaller bore, and consequently quicker twist; and eventually the ·303 bore was decided on with the Metford rifling.

The Lee-Metford was manufactured and issued in 1888. The bore was ·303 inch, rifled with 7 grooves, with a left-hand twist of one turn in 10 inches. I could never quite make out why a left-handed twist was advocated, but I have heard it had something to do with counteracting the rotation of the earth. It fired a bullet 215 grains, which had a lead core and nickel envelope, with a black powder pellet of 77½ grains contained in a solid-drawn brass cartridge case. This case caused a good deal of trouble at first, as it was difficult to find the exact alloy which gave the

right amount of hardness and elasticity to the case; if too soft, on the explosion it swelled into the chamber and would not extract; if too hard it cracked, and there was a nasty escape of gas at the breech; this, however, was soon got over. The rifle with this cartridge had a velocity of 1,800 feet, and a low trajectory.

When the manufacture of the Magazine Lee-Metford, as it was called, was in full swing, and after issue to the troops, many improvements and alterations were made, such as the enlargement of the magazine to hold 10 cartridges instead of 8, the introduction of "safety" or "locking belt"; about the necessity of this latter there was much difference of opinion, and other details.

The ammunition was also altered, and cordite substituted for the black powder pellet, which was of course a most important change, and finally the Metford grooving was changed to the Enfield, which, without altering the ballistic qualities of the rifle, added considerably to its life.

The present rifle with cordite has a muzzle velocity of 2,000 feet, and very low trajectory. It is a remarkably accurate weapon, as was found last year at Bisley when it was used for the first time by the Volunteers as their service weapon; the enormous number of highest possible scores made must have been a distinct cause of trouble to the Executive of the N.R.A. In that year the match-shooting at Bisley was restricted to ·303 rifles, and at the long ranges the scores fell off considerably, as any change of wind affects the comparatively longer and lighter bullet, much more than the heavier bullet of the old ·45 rifle.

When the introduction of the Magazine rifles was decided on, a number of Martini-Henry rifles were under manufacture by contractors, and it was settled that they should be completed to the smaller bore, so as to fire the same ammunition as the Magazine rifle. The outcome of this was known as the Martini-Metford, Mark II. This was a fine shooting weapon, but as the exterior of the barrel was the same size as the Martini-Henry it was heavy and not well balanced. Some of these were issued to the Colonies.

The rifle known as the Martini-Enfield has the same sized barrel as the Magazine rifle, and a large number of Martini-Henrys have been converted to this pattern by the substitution of this barrel and suitable fore-end.

This weapon was offered to the Volunteers, but they wanted the Magazine rifle, and their wish was acceded to; I think their choice was an unwise one, for the Martini-Enfield is a beautiful weapon, light, handy, well balanced, an excellent shooting arm, and is to my mind the finest military rifle in the world.

A very large number of carbines with ·303 bore have been made, some converted from Martini-Henry rifles and carbines, retaining the Martini action, and many Magazine Lee-Metford and Lee-Enfield carbines. It may surprise you to hear that there are as many as 14 different patterns of ·303 carbines now extant, of which about nine are in the Service. These carbines are excellent weapons and extremely accurate.

We have now but one description of cartridge for all ·303 rifles, carbines, and machine guns, a very great advantage from a store and supply point of view; and this brings me to one of the points which I am anxious to hear discussed, and to which I would ask you to give your careful attention.

It has for a long time been my great desire to see one universal pattern of fire-arm in the hands of all Services, and the weapon I am strongly in favour of is a carbine, fitted with a triangular bayonet with a sword hilt. I will take the principal points to be considered and compare the two weapons, when I think I can show that the comparison is distinctly in favour of the carbine.

1. *Ballistic Qualities.*—The velocity of the rifle is 2,000 feet, that of the carbine at present about 100 feet less; this, however, could be increased, I fancy, if necessary. It must be remembered that *now* the carbine fires the same cartridge as the rifle. In the Martini-Henry days, although this was possible, the kick rendered it almost prohibitory, while the special carbine cartridge rendered it a far less powerful weapon. Now, of course, there is practically no recoil with either weapon.

2. *Accuracy.*—Fired from a machine rest, this, at 500 and 1,000 yards, is about the same for both weapons, the carbine having a bit the best of it, probably because the shorter barrel of the carbine has less whip than that of the rifle.

The carbine is without doubt a more difficult weapon to make absolutely accurate target practice with than the rifle, not on account of any want of accuracy, but because of the shorter radius, that is, the distance between the two sights; but if absolute accuracy for target shooting is considered necessary for a service rifle, we ought to have the old match-shooting ·45 bore, with all its paraphernalia of wind-gauges, etc.

But there is very little bull's-eye shooting on service, and on service I believe the carbine would be the better shooting weapon of the two.

Some carbines made after this pattern were sent down to Hythe to be fired in comparison with the rifle, and I quote the following from Colonel Paton's report:—

Volleys were fired by ten men, some of whom were young soldiers, at a target 30 feet square.

At 1,000 yards the	rifle	gave	89·50	per cent of hits.	
,, ,, ,,	carbine	,,	87·81	,,	,,
,, 1,400 ,,	rifle	,,	67	,,	,,
,, ,, ,,	carbine	,,	69	,,	,,
,, 1,600 ,,	rifle	,,	55	,,	,,
,, ,, ,,	carbine	,,	48	,,	,,

Now it must be remembered that these men had practised for some years with the rifle, and had never fired with the carbine. Colonel Paton said that some of them had never seen a carbine before, and the carbines having been made in a hurry were never accurately sighted. There is very little in favour of the rifle in these trials, in fact, at 1,400 yards, the

carbine beat the rifle; and I am confident that, the conditions being equal, and the men knowing the carbine as well as the rifle, the former would beat the latter at long-range volley firing.

It is much easier to fire steadily with the carbine than the rifle at long ranges, as the back-sight of the former is so much lower than that of the latter, that the excessive straining of the muscles of the neck to look over the sight is not necessary.

3. *As a Pike with Bayonet fixed.*—This is generally advanced as a strong reason in favour of retaining the rifle, but if you go back to the old triangular Martini-Henry bayonet fixed to a cross handle like the present little knife, the advantage in length is in favour of the carbine, while the lightness and handiness of the carbine with this bayonet make it a far more efficient pike than the rifle and small sword-bayonet. I cannot like the present sword-bayonet as a bayonet, and when unfixed it is well-nigh useless as an offensive weapon. The bayonet I propose is as I say the old Martini-Henry triangular with a cross hilt, a more efficient and smarter-looking weapon than the present little sword-bayonet, both on and off the carbine.

I may remark that we have a large number of these bayonets now in store, and these would only require to be fitted to the cross hilt to be utilised.

4. *Weight.*—The average weight of the rifle is 9 lbs. 4 ozs. This carbine is 7 lbs. 7 ozs., giving an advantage to the carbine of nearly 2 lbs., which would allow of that extra amount of ammunition being carried by the soldier if wanted.

5. *Handiness and Portability.*—This is, of course, the great and, to my mind, very important point in favour of the carbine. The carbine is some 8 inches shorter than the rifle and can be carried slung with ease and comfort, leaving both hands free; the importance of this for Engineers, Mounted Infantry, Navy, and Marines engaged in boat work, and for all troops engaged as ours generally are on a campaign in a difficult, mountainous, or jungly country, cannot be over-estimated. The rifle is very much in the way and very uncomfortable when slung, the carbine is not, and when carried in the hand or on the shoulder is very much handier and, of course, lighter than the rifle; and I don't think any of us would take a Magazine rifle out for sporting purposes if one of these carbines was available.

6. *Ease of Cleaning.*—This again is much in favour of the carbine: there is less surface to clean, and on account of the shortness of the barrel it is easier to see when it is clean.

7. Lastly, if this plan were adopted there would be one pattern of arm for all Services, which would be a very great step indeed.

It would simplify supplies of components, arm chests, vocabularies of stores, and storekeeping to an immense degree.

These are the most salient points that occur to me, and I must say I should like very much to see a few of our regiments armed with carbines as I propose, so as to give them a trial. The change at first sight may

appear startling and meet with disfavour, because we are imbued with the idea that a carbine must be an inferior weapon; but when people get to accept the fact that this is not the case, the immense advantages possessed by the carbine must have weight and it will be adopted. Since writing this paper I see that the Austrians have partially armed their dismounted troops with a carbine.

You will see that the carbine with bayonet fixed has at all events a very smart appearance.

Before leaving the subject of the rifle, I should like to say a word about our bullet and bore. The Service bullet in use up to the present time has not given complete satisfaction, as it is somewhat lacking in stopping power; of course, a hard bullet travelling with great velocity has great penetration, but this very penetration prevents it from giving a great shock unless it strikes a large bone or pierces the heart or brain.

If you fire a bullet through a window it makes a neat little hole, but if you throw a soft lawn-tennis ball at it the shock to the window is very apparent. As an instance of the effect of a small bullet, I may mention that some years ago we had an accident at Enfield with a Morris tube; a man was shot with a bullet from one; it went in close to the backbone, and pierced one of his kidneys and his liver, coming out in front, and lodging in a gymnasium belt he was wearing. If this had happened in a fight, I very much doubt if the man would have known anything about it, and it certainly would not have stopped him; he walked to the hospital, and I saw him a few minutes after; there was no external bleeding, but of course his interior economy was damaged, and he took some time to get quite well; but he is still at work at Enfield Lock; and as I hear he took part in some rowing matches at Easter, there cannot be much the matter with him.

Now there is no difficulty in making a stopping bullet for the ·303; that has been known for a long time; it is, however, rather difficult to do so without interfering with its accuracy; but the chief difficulty lies in the amount of stopping power we are allowed to use in European warfare; we want a bullet which will stop our enemies but not hurt them too much; how much we may hurt them I don't know, but I do know that the Snider bullet hurt a very great deal and nothing was said about it. I also imagine that the Afridis, Dervishes, Zulus, and such like, who require a good deal of stopping, do not know much about the "Declaration of St. Petersburg"; on the other hand, I think that a European soldier who gets a plain unadulterated ·303 bullet through him will fancy he has earned his day's pay and take a rest.

I do think, however, that evolution, as far as regards the size of the bore and bullet, has gone far enough, and I trust that we shall not attempt anything smaller; if we do, we shall have to go back again to the Metford rifling, as I do not think the Enfield would stand the sharper twist necessary for the reduced diameter. The bullet also would lose, not only in stopping power, but in accuracy at long ranges; some of the Continental small bores I have tried lately are so affected by any slight change of wind

that it is impossible to get accurate shooting out of them on anything but a perfectly calm day, even at 1,000 yards.

II.—Pistols, Swords and Bayonets, and Machine Guns.

I had little experience of the heavy single-barrel muzzle-loading cavalry pistol formerly in the Service. In 1864 we had two muzzle-loading cavalry pistols in the Service, one with 8-inch and the other 10-inch barrel. They were rifled in five grooves, of the same bore as the Enfield rifle, and fired the same diameter of bullet, weighing 390 grains. No doubt its bullet was effective if it hit anyone; but the following anecdote, which was told me in India many years ago of a cavalry regiment with which I was stationed, tends to show that it must have been, to say the least of it, erratic:—

Every cavalry regiment had to fire a certain amount of pistol ammunition at the target every year, and on the occasion referred to a party had been marched to the range by the orderly officer, and began to fire their pistols at the target; the officer retired to a shady corner to read the paper, leaving the firing party in charge of a N.C.O. The officer was disturbed by the N.C.O. coming up and reporting, "I beg your pardon, Sir, but I have to report that Trooper Harris has just hit the target. What is to be done?" The officer was puzzled and then said, "Done? Why, do you think I ought to put the beggar in the guardroom?"

There were also other pistols in the Service with which I need not trouble you; some of these had movable stocks, so that they could be used as carbines. The Navy also had a smooth-bore pistol.

The Adams revolver, which came into the Service in 1868, was the first military revolver with which I had much to do. It was a solid-frame pistol, that is to say, the frame was rigid, and after firing the empty cartridge shells had to be punched out with a hinged ramrod. It was not a very powerful weapon, carried a bullet of 225 grains, with a charge of 13 grains of powder. There were no particular points of interest about it, but it remained for some years in the Service, being gradually replaced from the year 1880 by the Enfield revolver.

This was a considerably more powerful weapon. It carried a bullet of 265 grains, with a charge of powder of 18 grains. It was a self-extractor, that is to say, after firing, the empty shells were extracted by the mechanism of the pistol. It was rather a clumsy weapon, and though it shot fairly accurately as far as grouping went, yet it threw so high that it was necessary to aim at 20 yards very considerably below the point you wanted to hit.

In the year 1886 the Duke of Cambridge and Lord Wolseley (then Adjutant-General) visited Enfield, and the latter, when talking about pistols, said:—"Would it not be possible to have a short light revolver, of about 2 lbs., which would shoot straight and hard?" I said (I was Captain-Inspector then at Enfield) I thought it would; and on the next day began experiments, in which I was assisted by Mr. Speed, who was then Head Viewer, and is now Manager at Enfield.

We used an old Tranter pistol to experiment with. To have a lighter pistol it was necessary to shorten the barrel and cylinder.

Now it is manifest that the powder gas does not work on the bullet after it has left the cylinder, and at first it appeared as if the bullet would be gone out of the cylinder before much powder was burnt. It then struck me that by choking the end of the cylinder the bullet might be restrained until a considerable amount of powder was burnt, and then delivered into the barrel, which should not squeeze it any further, but simply communicate the spin.

We could not choke the end of the cylinder, but we got some Enfield pistol bullets and filed them to different sizes, until we arrived at a size which gave most satisfactory results, and we found that our little pistol not only shot hard, but straight at the point aimed at.

I reported these results to General Arbuthnot, who was then Superintendent, and then, in conjunction with Mr. Henry Webley, I worked out the dimensions and weight of the Webley revolver; of course I had nothing to do with the mechanism of the pistol, which was Mr. Webley's patent.

Some of these pistols were made, tried, and liked, and in the year 1890 were issued to the Service, and I think on the whole have given general satisfaction. The pistol has been much improved from time to time, and this one, a Mark III., is much superior in detail to the Mark I., though the dimensions and general principles remain the same.

It is a powerful little weapon, and shoots strongly and accurately.

Now a pistol is eminently a short-range weapon, and should most undoubtedly fire a stopping bullet, which should at all events knock a man down; this the original bullet did not always do, it had too much penetration, and unless it hit a bone would go right through and not stop a man for a certainty. For some years I have been advocating a stopping bullet, and have advised my friends when going on service to bore a large hole in the front of their revolver bullets; this, of course, materially adds to stopping power, but Mr. Webley's stopping bullet is far superior to this.

It is a cylinder with a conical hollow at both ends; it has quite enough penetration, but on striking flesh opens out and gives such a shock as will certainly stop any man.

Many kinds of magazine pistols are before the public, but all I have seen, though very accurate, are complicated, and fire much too small and light a bullet to be serviceable.

One of the advantages claimed for these high-velocity pistols is that they will kill a man at 500 yards; my rejoinder to this is, a Webley pistol will kill a man at 800 yards, if you hit him in the right place, for some of you may be surprised to hear that the extreme range of this little pistol as taken at Shoeburyness is 1,578 yards.

Some appliances have been brought forward for the quick loading of revolvers, but I cannot think they would be much use on service; a revolver would generally be used in a rush or mêlée when there would

be no time to reload in any case, and if there was time the few seconds longer which it would take to load from a pouch would not be of much consequence.

A cordite cartridge has been made for this pistol, and gives good and satisfactory results.

The bore of the pistol is ·441, the size of the bullet ·450. It will also fire the ·455 bullet.

Swords and Bayonets.

There have been so many changes in these weapons, and at the same time each change has been so slight that it would be wearisome to enumerate them, suffice it to say that since 1863 the pattern of the cavalry sword has changed five times.

We have always been seeking after a perfect cut and thrust cavalry sword, but an ideal weapon of this description is difficult, I might almost say impossible, to obtain. A perfect cutting weapon will not be a good thrusting one, and *vice versâ*; in 1887 the German Army seem to have given up the attempt, and their weapon of that day is a thrusting sword and nothing else.

In the year 1887 Messrs. Kirshbaum and Co., of Solingen, were making 1885 pattern cavalry swords for us; and swords for many other European nations. I am aware that there was a considerable outcry as to our obtaining swords and bayonets from Germany, and that to this fact were attributed by many the causes of complaint which had arisen in regard to these weapons in our Service. I am satisfied that this idea was entirely groundless. Solingen had been for centuries the manufactory of swords for the greater part of Europe, and for the excellence of the weapons produced could not be surpassed; while we had certainly then, as now, not more than two or three manufacturers in England who turned out swords in any quantities.

An extraordinary idea was at this time generally prevalent, which was that no matter what test or treatment a sword was subjected to, under no circumstances should it take a permanent bend or set. Nobody seemed inclined to complain should the blade break—that proved that it was "good steel," but if it retained a bend, under any circumstances, it was at once put down as no better than "hoop iron." Notions had evidently changed from Shakespeare's time. He tells us that on Henry V.'s return from France, his Lords desired him—

> "To have borne
> His bruised helmet, and his bended sword
> Before him through the city."

They evidently thought that having a "bended sword" was a credit to a soldier, as proving the good use to which he had put it. If they had lived in 1887 they would have had the maker and the inspector—especially the inspector—hanged.

It must be remembered that a sword is after all a bundle of longitudinal steel fibres, and if it is bent beyond its "limit of elasticity," if of

high temper, some of these fibres will break; if the bending is continued the sword will snap in two.

In the same way, if the sword is of low temper, the fibres will bend when overstrained and not recover their straightness, and the sword will remain bent. I had for some time been certain that our swords were being over-tested, and many of them much injured before being issued into the Service, as they were subjected to a very severe bending test. Now, though a sword may stand this very severe test once, it runs a chance of being so over-strained thereby and so injured as not to be able to stand anything afterwards.

On one of my visits to Solingen, I had an opportunity of comparing the various tests to which the swords of different nations were subjected, and the result was that I found our tests infinitely more severe than those of any other nation. Our view-room at Solingen was known as the "Chamber of Horrors," and this was at the very time when the responsible authorities were being clamorously assailed for not ensuring that our weapons were sufficiently tested. On my return on this occasion I wrote a strong report on the unwise severity of our tests to Colonel King-Harman, then the Superintendent at Enfield, who forwarded it, fully endorsing my views. Shortly after this the testing of our swords and bayonets was revised, and the tests all modified, so that those to which each description of sword or bayonet was subjected should be well within the limits of elasticity of that particular weapon. Swords and bayonets have suffered much, and much trouble has been given by amateur testing, and it would surprise you to hear some of the severe strains that these unfortunate weapons have been expected to stand.

Soon after the sword and scabbard was first carried attached to the trooper's saddle, the following incident occurred:—

A trooper dismounted, and allowed his horse to get away; it lay down and rolled in the hard road over the sword and scabbard. The very natural and certain consequence was that the sword and scabbard was so bent that the sword could not be withdrawn from the scabbard; there was a considerable fuss about it, and it was said that our swords and scabbards ought to stand this test; all I can say is that they don't and never will. I could recount several similar cases.

Again, on several occasions complaints have been made that swords have been notched at drill, and on inquiry it has been found that one man held a sword while another cut at it. Now, when the edges of two swords meet violently in this way, one of them must be damaged, and the weapon that will stand this test has yet to be invented. At the present moment we are in a peculiar position with regard to swords. The infantry want a perfect thrusting sword; the Navy want a perfect cutting sword; and the cavalry want a perfect sword for both cutting and thrusting.

As regards bayonets, they have been, roughly speaking, of two kinds, triangular and sword.

With the long Enfield we had a triangular bayonet 1 foot 5½ inches long, which when fixed made the weapon about 5 feet 11½ inches as a pike; there was a little difference, of course, between the long and short stocks;

the Navy had cutlass sword-bayonets for their short rifles, making them when fixed 6 feet 3 inches in length. Short rifles and carbines of the Army, with the exception of cavalry carbines, had sword-bayonets. This state of things continued with the Snider; but when the Martini-Henry was introduced, it being a little shorter than the Snider, the Martini-Henry bayonet 4½ inches longer than the old bayonet was introduced, bringing the length of the pike again to 5 feet 11½ inches.

So far the evolution of the bayonet from earliest times when it used to fit into the muzzle of the musket is plain enough, but the evolution of the universal knife-bayonet has always puzzled me. It was, I believe, copied from the one in use in the German Army. But I think there can be no doubt that for bayonet work the old triangular bayonet Martini-Henry was, and is, the best; it will go in and come out easily; and, fitted with a cross handle as the one I propose, it is an effective weapon when unfixed; while the little knife-bayonet makes an inferior pike, and as a weapon when unfixed it is well-nigh useless.

There seems to have been a change in opinion of those in authority as to the necessity for the length in "push of pike," for the length of the Lee-Enfield rifle, with knife, is only 5 feet 1½ inches. The carbine I propose with Martini-Henry bayonet is 5 feet 1⅝ inches long. The Snider and Martini-Henry were, as has been said, close on 6 feet.

Prior to the introduction of the present universal pattern knife-bayonet many different kinds of sword-bayonets have been in use for various carbines and short rifles; of these some were good, some indifferent, and some downright bad. Time will not admit of discussing them.

Machine Guns.

For some years experiments had been made on machine guns, but the first machine gun in our Service was the Gatling, introduced in 1875. There were two sizes of these, one of ·45-inch calibre and one of ·65-inch. Each gun had ten barrels fixed in circular discs. This ring of barrels was revolved by turning a handle, and each barrel discharged in turn when it arrived at a certain position. The gun was ingenious, fired about 450 rounds a minute with considerable accuracy, but was very heavy, complicated and easily put out of order.

In 1882 came the Gardner guns—there were five-barrelled, two-barrelled, and some one-barrelled; these were of rifle calibre. The two-barrelled gun may be taken as the typical Gardner gun, and we have a large number of these in the Service. Its action was extremely simple, and the parts few and strong. It fired, by turning a handle, at the rate of about 300 rounds a minute.

The first Nordenfelt guns came in in 1878, and were of two natures—one firing rifle ammunition and one firing a cartridge with 1-inch steel projectiles, for use in the Navy only.

There were many different patterns of the rifle bore—three, five, and ten-barrelled—and many improvements were made in the action, and the latest mark had certainly a beautifully-designed and fitted action, which could very easily be taken to pieces without the aid of any instrument. The

five-barrelled gun may be taken as the type of these, the action of all of them being the same. It is fired by the horizontal backward and forward motion of a lever, and at the rate of about 500 shots a minute.

There were some ·4-inch bore guns made of both Gardner and Nordenfelt pattern, and some of these latter are still in India. In comparing these three guns—Gatling, Gardner, and Nordenfelt—I think it may be said that the Gatling was the most accurate; the Gardner the most simple; and the Nordenfelt the easiest to work. I confess myself that I have always had a sneaking preference for the two-barrelled Gardner, on account of its great simplicity, and consequently on the great ease with which any damaged part could be replaced, and also on account of its certainty, for it seldom got out of order.

I do not think that our noble Chairman agrees with me, for I fancy the five-barrelled Nordenfelt was his pet gun, and it certainly did yeoman service with him up the Nile in 1884.

The cartridges of these three natures were contained in hoppers, fed into the gun, more or less, by the action of gravity. A Mr. Accles invented an actual feed for the Gatling gun, but I do not think it was altogether a success, and only 14 were issued.

I may mention here that in consequence of the idea that the bottle-shaped cartridge for the Martini-Henry rifle would not load well into a machine gun, a special form of chamber called the "Gatling-Gardner" chamber, which took a cartridge with a less pronounced shoulder, was introduced into the earlier ·45 machine guns, and that chamber is still continued in naval ·45 guns, even Maxims, although the Martini-Henry chamber was introduced for ·45 land service guns. The consequence is that while the land service guns fire Martini-Henry solid case cartridges, the naval guns will not do so, but have a special cartridge.

We now come to a great step, the introduction into our Service of the Maxim automatic gun. I need hardly say that an automatic machine gun is one which loads, fires, and reloads itself as long as the trigger or firing-lever is kept pressed down and the gun is fed with cartridges. The great advantage of this class of gun is that a rapid stream of bullets can be directed at a moving object, or quickly changed from one point to another by casting loose the traversing and elevating gear, and using the gun like a fire-hose. Now this cannot be satisfactorily done with a gun which is actuated by working a lever, as the rotatory or reciprocating motion of the lever would quite derange your aim if the gun were not held by the elevating or traversing gear.

Mr. Maxim submitted various patterns in the year 1886, and he will forgive me for saying that his inventive genius nearly drove me frantic at this time, for no sooner did I think that the pattern was finally settled than he would be down again at Enfield with two or three more guns, all with various improvements, and the whole thing had to be done over again.

At last the pattern was definitely settled, and the first Maxim guns were issued in 1887. The gun has been improved in various mechanical details, with which I need not trouble you.

The weight of a Maxim gun, both ·45 inch and ·303 inch, is 60 lbs., which shows what strides have been made in machine gun construction in the last 20 years, since the first machine-gun introduced, viz., the Gatling weighed 416 lbs., and fired 30 per cent. slower.

The principle of the gun as you know is one of recoil, that is to say, the recoil of the barrel after each shot is made use of to load and fire the next one.

The ·450 calibre gun, with black powder, worked well and gave much satisfaction, but when the ·303 bore was introduced and cordite, there being very little recoil, a great difficulty had to be encountered, and I confess that I looked upon the first ·303 guns that were made with much suspicion, and there was certainly a good deal of difficulty in getting them to go with any degree of certainty. But improvements have made the action of this gun pretty certain. It fires from 450 to 550 rounds a minute, and of course it is of great advantage to be able to use smokeless powder with a machine gun.

I am afraid the dearest friends of the Maxim gun can hardly call its action simple, and every single part of the action has to be very minutely gauged. Even after passing these minute gauges sometimes the gun will not work, and it is difficult to find out why not. We had a curious instance of this once; every gun has a spare lock issued with it, and on one occasion we had a gun which went perfectly well with one lock, but would not go with the other, every part of which gauged exactly, and the two assembled locks were the same weight; we took the two locks to pieces, mixed the parts up together in a box, and then re-assembled them; the gun then went perfectly with both locks.

While on this part of the subject, I should like to state that it is my very strong opinion that every officer and N.C.O. who is likely to have charge of a machine gun in the field should go through a short course at Enfield, to gain not only a knowledge of the mechanism of the gun, but also a knowledge of the chief causes of failure or stoppage, and how such failure can be rectified. We are continually having complaints of the failure of guns, and on examination it is found that the fault is not with the gun, but with the lack of knowledge of those using it.

I will take one instance which is continually happening. The fusee spring is a spiral spring, which brings the gun back into position after firing; the weight of this spring for the ·303 should be from 5¼ to 7 lbs., that is to say, when all is right and under normal conditions the gun should fire correctly with spring between these weights. If the spring were put lower than this under normal conditions the gun would knock itself to pieces, but several causes may arise which will check the recoil of the gun; sudden and intense cold may reduce the recoil given by the cordite, sand or grit may get into the action, or want of oil may cause too much friction, etc., and in such a case, if there is seen not to be enough recoil, in an emergency the fusee spring should be lowered below the prescribed limits until the gun works. Of course, if time will allow, and the cause is discovered, it should be rectified as soon as possible, and the spring put up to its proper weight.

The Maxim gun is a good gun, but it can hardly be called an ideal automatic gun, and I believe that the evolution of automatic machine guns is still in progress.

I am strongly of opinion that the qualities to be desired in a machine gun are in the following order of merit:—

1. *Certainty of Action.*—This I consider immeasurably outweighs in importance every other consideration. If a gun will only go on firing steadily and certainly it is a matter of small importance whether it fires 300 or 600 shots a minute, but it is very certain that it would be far better that it should fire 6,000 shots steadily in ten minutes, than the same number in five minutes, and then stop. The ideal gun in this respect should be ready and willing to commence firing, and continue firing with absolute certainty of action for an indefinite period.

2. *Simplicity.*—The first condition must, I think, be to a certain extent dependent on this, for naturally the fewer parts a gun has, the less chance there is of any particular part giving way.

It is most desirable that the parts should be few in number, and these should, if necessary, be quickly and easily replaced, thus doing away with the necessity of mechanical skill; also, fewer spare parts are necessary.

3. *Endurance.*—By this I mean the capability of the various parts of the mechanism to resist wear, and the jar which seems to be necessarily inherent to all automatic machine guns.

4. *Accuracy.*—Extreme accuracy is not absolutely necessary for a machine gun in the field; you don't want to put 20 or 30 bullets through the same man, and an automatic gun with a lateral spread would be rather a good thing. Accuracy of course depends upon the barrel and steadiness of the mounting, and the accuracy of the barrel depends on how long the rifling will stand. The intense heat of the cordite flame has, *ceteris paribus*, shortened the life of the barrel.

Excellent results have been obtained with nickel-steel barrels, and many of them are in the Service.

III.—Inspection.

I come now to a subject about the details of which little is known by the general public, or even by the Services. The duties of the officers engaged in the inspection department require the greatest possible care, and involve great responsibility. So long as everything goes right, little is heard of them, and I fear the Services generally hardly appreciate them as they deserve; but should a weapon find its way into the hands of Navy or Army in which any defect, often an imaginary one, is discovered, it is at once "Who was the inspector?" "Hang him!" I much wish that officers and others who are interested in the subject would visit Enfield oftener than is the case. We should always be delighted to see them and show them the various tests and trials to which the weapons they are interested in are subjected.

Inspection of arms may be divided into three heads:—

1. Inspection of arms during manufacture.
2. Inspection and trial of the finished arms.
3. Inspection in the hands of troops.

Up to the year 1888 manufacture and inspection were under one head; in that year they were divided into two departments. I do not propose to discuss the advisability of this course. The aim and object of the inspection branch remain unchanged—they are to guarantee that good and serviceable weapons are passed into the Service, and from periodical inspections to insure that they remain so.

A good inspector of small-arms must, in addition to having a good knowledge of the mechanism and use of the weapons he has to examine, be endowed with a large amount of common sense, for by the aid of this latter most of the questions which he has to decide must be answered.

In the course of manufacture components of any arm are rejected for one of two causes—bad workmanship or bad material. Now the men called viewers, who examine and gauge the work, are necessarily allowed very little discretion, and if any component is manifestly not good enough for issue the viewer rejects it; but if it is very nearly right, but not quite, he has to put it on one side, and it is then for the inspector to decide whether it should be taken or not. His common sense must come into play, and he should put to himself the question, Will this defect seriously interfere with the efficiency or interchange of the weapon or not? If he can answer this in the negative he is generally pretty right in accepting the article in question; if not, the reverse. Though this seems very simple it is not so always, and very often an inspector has some puzzling cases to decide. He should be quite sure he is right, and be able and prepared to defend his decision if it is called in question, which it very often is.

Articles are rejected, as I said before, for one of two reasons:—

1. Bad workmanship.
2. Bad material.

In the last 20 years machinery has so vastly improved that there is very little rejection for bad workmanship. Most of the machines are automatic, and when once a machine is set it goes on turning out the same component hour after hour precisely the same, and there is no chance of its getting tired, careless, or making a mistake; wheels and cutters may and do wear, but this is at once discovered and the machine re-adjusted. To give you an idea of the improvement in machinery, I will give one example—"the barrel-boring machine." Up to 14 years ago the machine was a vertical one, the barrel revolved, and the boring-bit was fed down by a handwheel; the barrel was bored first at one end and then at the other. One man had to look after it, and it took 70 minutes to finish a barrel.

Now the drilling machines are horizontal, each machine bores three barrels from each end at once, they are entirely automatic, bore three barrels in 35 minutes, and one man looks after two machines, as all he

has to do is to take out the finished barrels, and put in fresh ones. These machines are very accurate, and the barrels require very little setting, which of course is a great thing. Instances like this might be multiplied *ad infinitum*.

The second cause of rejection, "Bad material," is a more serious matter, and it is much more difficult in many places to detect.

Carefully-devised chemical and mechanical tests are, of course, laid down in the specifications, and all that the inspector has to rely on are these, and careful examination under a powerful lens of the texture and appearance of the metal. But from my experience of steel for components of small-arms I have very little faith in chemical and mechanical tests for that material. I am pretty sure that however carefully such tests are applied, cheap indifferent steel can be manipulated so as to stand them, and yet be quite unsuitable for the purpose for which it is intended.

The real test is how the steel behaves in manufacture and after manufacture, how it behaves in the finished arm.

When a private firm makes weapons of any kind for the Government they find out by actual trial and experiment what quality of steel is most suitable for each component, both for working and standing the various tests and trials to which the weapon is put when finished; when the private manufacturer finds he has got satisfactory stuff, he will stick to that kind of steel as long as possible, the original cost of it being quite a secondary consideration, as he knows that if his material is not good his finished weapons will be rejected, components will break in the various tests, and his loss will be very considerable.

The result of this is that when the components have gone through the prescribed course of inspection, the inspecting officer passes them into the Service with confidence, which experience has shown is rarely misplaced.

I have sometimes been inclined to think that in such matters the heads of the Government manufacturing establishments are not allowed quite so free a hand as is desirable. They do not make purchase of material themselves, and even if one batch of metal proves entirely satisfactory there is no certainty that the next lot required will be of exactly the same character, or the produce of the same manufacturer, consequently although it may be very good stuff it may require a totally different treatment during manufacture in order to give satisfactory results. I do not think the system of obtaining steel for the purpose in question by open contract (even if tenders are invited from only a few firms) is quite satisfactory. Price may enter too much into consideration; as it may be laid down as an axiom that:—"No steel is *cheap*. Good steel is necessarily expensive, and bad steel is dear at any price."

Do not misunderstand me; I do not mean to imply that we are not using good steel *now*; I think all the steel now used in the manufacture of small-arms and machine guns very good and satisfactory. I am only propounding what I consider the right principle on which this satisfactory state of things should be arrived at and maintained, and I think the easiest

way to arrive at it is, as I have said, to give the superintendents in charge of Government small-arms factories a free hand in the use of suitable steel.

The chief cause of rejection for bad material is the presence of what are known as "greys" on the surface of the metal. A "grey" is a fine black line, or even a speck, and it may be the top or bottom of a hollow in the metal; if possible, when one of these is observed, a fine file is used to see if the grey increases or disappears; this plan, however, is not feasible in the interior of a barrel, and as it is impossible to say how far in the "grey" may go, or how big a hollow there may be in the metal below, it is a hard and fast rule that no barrel should be passed into the Service having a visible "grey."

I will give you an instance of a case which happened a few years ago. A particular rifle was passed as the barrel was perfectly clean inside and out; it was finished and made into a rifle, passed the heavy first and second proofs, and was then handed over to the man who was firing for extraction (three service cartridges are fired from every rifle to test this). He fired two shots, and at the third shot the rifle burst and blew his hand off. On examining the burst barrel, I found a large hollow inside the metal, only covered by a thin skin of metal on the out and inside. Of course if this hollow had come to the surface it would have shown as a "grey," and the barrel would have been rejected. This accident confirmed me in the opinion that as hollows *might* exist undetected, any barrel which had the slightest suspicion of such a hollow should be rejected.

Before leaving this branch of the subject, I wish to say a few words on the subject of the sighting of rifles, and the various tests applied, as I have been lately continually asked questions about it.

When the pattern of any new rifle is definitely settled, a number of them are fired at different ranges, and from the mean result the sighting of that particular arm is definitely settled. Every kind of rifle has a "throw" peculiar to itself, that is to say, it has a tendency to throw to one side or the other of the point aimed at; this may be due to the system of rifling, the mode of stocking, the whip of the barrel when fired, all or any of these causes. The Martini-Henry threw to the right, and this was compensated for by fixing the back-sight at an angle to the left. The Lee-Metford threw to the left, and in this case it was compensated for by having the barleycorn to the left.

The sighting having been determined on, a standard barrel is very carefully made with this sighting, and from this all the delicate sight-testing machines are made. The sights of the finished barrels are very minutely tested, and it is quite certain that the sights of all rifles of the same pattern are absolutely identical.

When the rifles are finished, 10 per cent. are fired from a machine rest for accuracy at 500 yards. They have to make a pattern having a figure of merit below a certain standard; if any rifle does not pass this, which is very rare, it is sent back to the factory to be overhauled, and, if necessary, re-lapped.

Now it is a curious fact that barrels, though rifled by the same machine, with absolutely identical sights, tested to the $\frac{1}{1000}$th of an inch, will, when made into rifles, not all shoot in the same direction, and some of them may "throw" considerably, either high or low, left or right. If this is noticed when the rifle is fired for accuracy, it is sent back for re-examination and adjustment if necessary; but as it is manifestly impossible to fire every rifle at a target, when as many as 3,000 are made in a week, it stands to reason that now and then a rifle may get into the Service which "throws" a bit to one side; this of course would be absolutely immaterial on service, but it is a distinct annoyance when shooting at a target at 200 yards, say, to have to aim a foot to one side of the bull's-eye.

In the case of target rifles made by private firms, for private individuals, each rifle is shot at the target, and the sight regulated by hand, until the rifle shoots centrally, but it is manifestly impossible to think of adopting this method for a moment when rifles are turned out by the thousand.

It is, however, not quite correct for officers, when reporting this matter, to say the rifle is a bad shooting rifle; a bad shooting rifle is one which does not keep its elevation, or that shoots sometimes to the right and sometimes to the left, in fact, all over the place; but one that shoots invariably a certain distance to the right or left, high or low, merely wants the sights adjusting to make it shoot perfectly straight and well.

Inspection of Arms in the Hands of Troops.

This was instituted as a regular thing in 1887. Since then the arms of all Regulars in Great Britain and Ireland have been examined every year—those in the Militia once in three years, and Volunteer arms were sent to Birmingham periodically for inspection and repair. I shall never forget the state of some of the arms when I first began this examination, some of them were so absolutely dirty that I could not see down the barrel. However, matters soon improved, and the arms in the hands of troops were, on the whole, kept in a very satisfactory condition; but, with the introduction of the small bore and cordite, matters became very bad again, and it was some time before *all* concerned could be got to understand that arms firing cordite required more and constant cleaning, than those firing black powder; such, however, is undoubtedly the case. There is very little dirt or fouling to be seen in the barrel after firing cordite, and what little there is is very easily removed; having done this I have no doubt the British soldier thought all was well, and I have also no doubt many were much surprised on looking down their barrels the next day to find them red with rust.

There have been various reasons given for the formation of this rust. One generally believed in by chemists is that the intense heat of the flame of cordite has such an action on the surface of the barrel as to render it what may be called very sensitive to moisture, and consequent formation of rust. This may be, and is, no doubt, true, but I cannot help thinking there is something more.

The products of the explosion of gunpowder are distinctly alkaline, which of course is a preventative of rust; those of cordite are not only not alkaline, but I cannot help thinking have some action on the barrel which actively in ducesrust, and I think so for this reason: if you carefully wipe out a barrel after firing cordite, and then leave the inside of the barrel coated with oil, on wiping this oil out with a white rag some hours after you will find it red with rust; now this rust could not have come from the moisture in the air outside, as the surface of the barrel was covered with oil, it must therefore have formed underneath the oil on the surface of the barrel.

However, I am not a chemist, and I may be wrong; it is sufficient for us to know that arms after firing cordite *will* rust, unless carefully and constantly cleaned.

There is no royal road to it that I know of, but it does not take much time or trouble to wipe the barrel out with the pull-through and rifle oil, as soon as possible after firing, being careful to leave the barrel coated with the rifle oil, which, as you know, has a certain proportion of alkali in it, and repeat this operation as often as possible; as I say, it does not take much time, and the oftener it is done the better. If any rust is found to be forming, the double pull-through will remove it if applied at once.

Do not use cleaning rods, or if you do, see that they are made of hard steel. Cleaning rods of wood or soft metal damage the barrel and grooves.

It took some time to convince soldiers of the necessity of this constant cleaning, and for the first few years after the adoption of cordite the number of arms destroyed from the action of rust was appalling.

On examination, all the arms found rusty were sent to Birmingham to have the rust lapped out if possible; now, the bore of the barrel is ·303 inch, and after it is enlarged beyond ·308 the shooting falls off; in other words, it is only possible to remove 2½-thousandths of metal without destroying the barrel, the consequence was that a very large number of barrels had to be replaced by new ones.

I had an idea that cordite rust would not injure the shooting of a barrel much, and I carried out some experiments, firing a rifle with cordite twice a day for some months, leaving it uncleaned; it was in a terrible state of rust at the end, but shot just as well as the first day.

In consequence of this we have stopped sending barrels with rust in them to Birmingham for repair, unless so bad as to be dangerous. The rust is removed on the spot as far as possible by the armourer-sergeant, and the rifles remain with the regiment. I am glad to say, however, that the inspections of the last two years have been very satisfactory, and every one concerned seems to have got over the difficulty of cleaning. I have also lately examined the arms of many Volunteer battalions who have now had the Magazine rifle in use for some time, and the very excellent condition in which I found them all not only reflects very great credit on all concerned, but shows that they have found no insuperable difficulty in cleaning their arms after the use of cordite.

There is one more point that I want to draw your attention to. I have said that after the bore of the Lee-Metford or Lee-Enfield exceeds ·308 the shooting falls off; this generally speaking is the case, but it is not invariably so. If the lands between the grooves alone wear away, the rifling almost disappears and the shooting falls off; but if the lands and grooves wear equally, the bore may be enlarged many thousandths more before the shooting is much damaged.

For this reason I have always been averse to the indiscriminate issue of gauge plugs. If this were done many perfectly serviceable weapons would be destroyed. The one satisfactory test in this matter is the practical one of firing from a sand-bag rest at the target, the serviceability of the rifle being judged from its performance.

I found on preparing this lecture that the subject was so large as to render it quite impossible to go into as much detail as I could wish without exceeding the limits of a single lecture. I have therefore been obliged to curtail considerably, and pass over many weapons in a somewhat slip-shod way. I have also only noticed those weapons with which I have personally come in contact, either professionally or otherwise. I hope that what I have laid before you has been of interest, and that my venturing to trouble you with my own opinions and experience may be excused, when it is remembered that my position has compelled me during a large portion of my life to give much thought to the subjects dealt with—subjects of paramount importance in connection with the efficiency of the Services.

Major J. FORMBY (3rd V.B. Liverpool Regiment):—My lord, ladies, and gentlemen, we hear a great deal of the very strong corrosive action of these new powders on barrels. Would it be possible to go back to iron barrels instead of steel? I cannot help thinking that they have some advantages. I remember many years ago at a time when I thought I could shoot, I took the opinion of a man whose name as a user of the rifle is very well known, that is Mr. Humphry. At that time steel barrels had been in use for some years, in fact they were made regularly, but iron barrels were still on the market. I wanted a new barrel for my rifle, and asked him what I should do. He said, "If you want to be liable to come to grief at any moment, get a steel barrel." I believe the reasons are that their on barrel is very much less elastic, though it is not so hard; it consequently has less whip; it does not heat so rapidly, and does not expand so much or tighten so much against the bands of the rifle, and so get choked. Another thing is, that it is not so liable to corrosion, and if it does get corroded it is more easily cleaned than steel, it is also cheaper. Of course there is a theoretical difference in the weight, but I venture to think that that is so infinitesimal that it would not come in the way. Do we gain much by having gone so very far in the direction of the small bore? It was largely brought on by the theoretical experiments of a Swiss officer. I venture to think that since we have taken up shooting both from the theoretical point of view and the practical view our men have been always at war somewhere or other, and we have quite as good means of judging both theoretically and practically as the Swiss officer has. I believe also I am correct in saying that after a certain point decreasing the calibre of your weapons does not decrease the weight, because going beyond a certain point the theoretical thickness of metal which is required to stand the explosion is not sufficient to stand the severe wear and tear of service and the knocking about. Therefore you have to make actually a heavier barrel as you

go smaller with the bore. I happen to know, for I have tried it—and I think anybody else who has tried it would know—that you cannot get a ·303-bore barrel into the same space as you can a Martini-Henry, it is very much thicker at the breech. I fancy that the minimum point is somewhere a little below ·4. If we had a barrel about ·38 or ·39 should we not have a rifle with a sufficiently small bore for the ammunition to be light, at the same time giving the minimum of weight in our rifle, and also firing a slightly heavier bullet which would shoot through all weathers, which the present light bullet does not? Men tell me that the present ·303 bullet is exceedingly sensitive to anything but a light wind. Speaking as a Volunteer officer, I must say I quite agree with the lecturer in what he said as to the Volunteers' and Magazine rifles. I cannot help thinking that unless the Government are prepared to insist on an increased rigidity of discipline the magazine would not be of any use on service; in fact, to prevent it being of more harm than good, it would be infinitely better not to have one. As to the carbine, we are always trying to get a lighter weight for the soldier. Supposing a carbine were carried by all ranks it could easily be slung, perhaps as the American cavalry do, with a cross belt over the left shoulder and a snap hook under the arm, hitched up and hanging with the lock just under the right arm. As to the sword, is not the foot-soldier's sword principally used for in-fighting? I have heard it stated that the only fighting sword in the Army is the bandsman's sword, which is nearest to that of the old Roman legionaries—a short, heavy, cut-and-thrust sword. Surely in a fight a man trusts more to laying about him than to careful fencing? Then I have often wondered at the tests for swords. One has heard the point with regard to the "fatigue of metals," that the metal which has been severely overstrung has molecular change set up in it, which may go on even after it has been put away and materially affect the temper—in fact, we know that many engineers consider that that will soon take effect on iron bridges, and some are being reconstructed in consequence. Could it not be managed something like the test for armour plates? A certain number in every batch should be severely tested, and if they passed the test the rest of the batch should be accepted, but not those which had been tested. I think it might be instructive if one weapon which had been severely tested and another of the same batch which had not been tested at all were kept for a time and afterwards microscopically examined. Lastly, as to the bayonet. Supposing a short bayonet has to be used, perhaps not longer than the little knife-bayonet, could it not be something which would be of some use, say, what some of the Malay tribes call a "parang," a heavy iron jungle knife of soft metal which will go through everything and cut hard woods which the others will not do, a pretty heavy weapon, and balanced something like a Gurkha-Kukri, only much straighter and rather heavier. When it was not on the rifle it would be a very powerful weapon for in-fighting, and it would also do for a bush knife very well indeed. A good heavy jungle knife perhaps with a guard on it to help it being fixed to the rifle would be a more serviceable weapon altogether—quite as good as a bayonet, and better for other things.

Lieut.-Colonel E. GUNTER (late E. Lancashire Regiment):—I think that when an expert in the position of the lecturer takes the trouble to prepare so excellent a paper as we have had read, and comes here to give us the benefit of his long experience on a subject of such importance to the Army, the members of this Institution and of the Service generally are much indebted to him. I am not an expert, but since I was a cadet at Sandhurst I have used all the rifles which the lecturer has described, and some foreign ones. I quite agree with him on many of the points he has brought forward. I think, however, his proposal to substitute for the present rifle a carbine for the general service of the infantry is open to question, though it might answer for special services, such as cyclists, etc., if the same calibre were kept to. When at the School of Musketry I preferred firing with the "short rifle" for short (standing) distances, and so did others, but for long ranges we all preferred the

long rifle. I think the soldiers generally would have more confidence in the long rifle to shoot with, which is a great matter, and it is a stronger and more formidable weapon. I think it would stand rough knocking about better. I quite agree with what the lecturer has said about the dagger-bayonet. I think it is too short. The French, Russians, Turks, Spaniards, and others use a longer rifle (with the bayonet fixed), and opposed to them or to cavalry our infantry would on this account be at a disadvantage. The lecturer proposes to return to the old triangular bayonet with a cross hilt; this I agree with, if it is put on a long rifle. I am aware that with a long bayonet the whole rifle might be too heavy, but I think this might be modified, and the rifle lightened to something like that of the Belgian Mauser pattern. I think that for general purposes the thrust bayonet is the English infantry soldier's weapon, better than any sword or knife-bayonet. With regard to the making of swords in Germany, I have no doubt that the best of the Solingen swords are excellent; but can we be sure of getting the best? And there is this to be considered:—In time of war we might not be able to get these weapons from abroad. Surely we ought to urge the Government to encourage the manufacture of swords in England, and all orders for the equipment of our Army should as far as possible be kept in English hands. The lecturer has referred with some satisfaction to the process of hanging a manufacturer or inspector. If you wanted to hang a maker you might do it in England, but if he was in Germany you would not be able to get at him. I hope the noble lord in the Chair will give us his opinion as to the length of the rifle and bayonet as a pike, for no one is better able to judge of the fighting qualities of our weapons than he is.[1]

Captain W. JAMES (late R.E.):—I was glad to hear the lecturer speak up for the old Martini-Henry with its drop-block. I believe that of all the drop-blocks—and there were many when this was adopted in the Service—the Martini action was far and away the best, with possibly one exception, and that was the Soper, which I have no doubt the lecturer knows well. The Soper was, unfortunately, late for the competition which took place, which resulted in the Martini being adopted; but I have always thought myself that the Soper was, without doubt, the best drop-action that ever was invented. Forty-nine shots have been fired from that in a minute. Of course the cartridges were laid out beside the men who fired them. That shows that with regard to rapidity there is no action in existence that ever approached what could be done with the Soper. The inventor of it was a gunmaker at Aldershot, and I am sorry to say that the fate of many inventors overtook him, for he ruined himself over the production of this rifle. The lecturer has alluded to the ·4 rifle. It has always seemed to me that the genesis of that rifle was one of the most remarkable examples of how not to do it which ever occurred in any Government department. To begin with, we halted between two opinions. We were not going to have a small bore and we were not going to have a large bore, but we halted midway. The rifling that was suggested for the ·4—I venture to use the word with the greatest respect—was farcical. It was known when that rifle was introduced that it was not capable of giving good results. I alluded to this ·4-inch rifle for one very good reason. If ever the Royal United Service Institution justified its existence it did so in that particular instance, because it was a lecture which Colonel Arbuthnot gave on that rifle and the very heated discussion which took place afterwards—the meeting was numerously attended—which brought before the public what the bad points of that rifle were. Had that discussion not taken place, with a subsequent discussion which followed in the *Times*, we should have had inflicted on the British Army and Navy the ·4-bore rifle, and the introduction of a magazine rifle would

[1] I omitted to state, as I intended to do, that I hoped for various practical reasons, that the calibre of the rifle would not be reduced below what it is at present.—E. G.

have been put off to that far-distant date—the Greek Kalends. Because, as I said at the time in the *Times*, we are all sufficiently acquainted with the ways of Chancellors of the Exchequer to know that if they have once given a large sum for the introduction of one armament, it is a thousand to one they will not produce another large sum within a few years for the total re-armament of the Army. And that is what would have happened, since it would have been perfectly impossible to have kept a single-loader rifle, in face of the general introduction of magazine rifles throughout the whole civilised world. The Lee-Metford has been virulently attacked, more than all the faults that rifle-flesh is heir to have been attributed to it; but I always think that the criticism has been somewhat exaggerated. It is not, perhaps, a perfect weapon; but as few human beings are perfect, so probably few rifles are perfect. I have always thought that the introduction of the old Lee bullet is a mistake; it is unnecessarily costly, and its very *raison d'être* has ceased to exist with the rifle to which it was adopted for English service. The old Lee bullet was adopted to extract the awkward straight-sided cartridge of the U.S. Army rifle. That cartridge is not adopted by us, but we have the cone-shaped cartridge, which is very much more easily extracted; and the particular action of the Lee bullet, which is valuable in the one case, was an unnecessary complication when applied to our good cartridge. I have therefore always thought, and still think, that a simpler form of bullet, such as that in use on the Continent, might have been perfectly well adopted by us. Again, there is the Metford rifling. I think that most people who have studied he question believe that while the Metford rifling was the most perfect rifling for what it was invented for, it is not suited to a hard-coated projectile. I believe that the Enfield rifling, which is practically the same kind of rifling in use by every other nation in Europe, is far better adapted for a projectile of that character. I am afraid I am going to join issue with the lecturer on two points. The first is, the necessity of the Magazine rifle; and the second is, the introduction of the short carbine. As to the absolute utility of the Magazine rifle, that may be more or less open to doubt; but one thing is not at all open to doubt, and that is the sentimental side of the question. When you see trumpetted forth in all the military organs in Europe the value of the Magazine rifle, and are told of the great things which may be expected from it, I think it would be wrong, from a sentimental point of view, to have kept the British troops without the Magazine rifle. Moreover, I think there are distinct advantages to be derived from the Magazine rifle if properly applied. Let us compare the Lee-Enfield with the weapons which exist at the present moment. I will not discuss the form of bullet any longer, because I have said what I wished to say on that point. But let us look at it from the Magazine point of view. What is the main point on which our weapon differs from that of every other nation? Chiefly in this, that we have not adopted the clip-loader. We have a magazine which holds ten rounds, and they are not to be used until the supreme moment has arrived. Who is to be the judge or what is the supreme moment? Jones thinks it has arrived; Brown does not think it has arrived. Jones's men fire off their ten rounds, and are left with a weapon which is only a single-loader. Supposing he is opposed to Continental troops, what is his position? With a clip-loader they can put five cartridges after five cartridges into their magazine. Why on earth we have never adopted the clip-loader in England passes my poor comprehension. I believe it is an absolute necessity to enable our troops to meet those of foreign Powers to give them the clip-loader. They say, "Oh yes; but that does away with the weapon as a single-loader." It does not at all. It is perfectly easy to take the cartridges out of the clips. Take the Belgian clip. You can get them out as easily as possible, and so you can out of any. You might have a certain number of clips, if you are still so wedded to your single-loader, in the pouches which could be used to fill up when the troops are under severe fire, and at other times you could use single cartridges for single-loading purposes. I do not think that it is right to send our troops into the

field against foreigners who have clip rifles unless we also have them. I have always thought that a needless complication was the cut-off. What do you want the cut-off for, and what is the advantage of it? If you have a properly-constructed weapon, certainly with a clip-loader you do not want a cut-off at all, and I have never seen any advantage to be derived from it. No other nation practically has it, and I can see no advantage to be derived from the introduction of this complication to the breech-loader mechanism. With regard to the bore of the rifle, personally I agree entirely with the lecturer. I think we have got them quite low enough, but do not let us forget one thing. Very great effects are still produced with the ·256, that is to say, with a properly-constructed bullet the setting-up power of even a bullet of that diameter is so great as to effectually stop any human being and most animals coming against you. The experience of men who have done deer-stalking in Scotland would prove that. We must not despise the advantages of the small bore, although I think we have gone low enough; and it must not be forgotten that the stopping power can always, as we know, be got by a modification of the bullet. Let us remember one thing however. If you have too much setting up you do not have penetration. A man who is hit through the heart or the head with even a small bullet is *hors de combat*; it is quite true that a man hit through the fleshy part of his person is not perhaps placed in that position; but it is not an advantage to throw away to have a thing which will go through four or five men. I therefore hope that in this craze for stopping power we do not absolutely throw away the great penetrative power of the bullet hitherto in use in England.

Major-General H. T. ARBUTHNOT (late R.A.):—I had not intended speaking this evening, but as Captain James referred to a lecture which I gave to this Institution twelve years ago I should like to say a few words. Captain James says that the rifle it was then proposed to adopt was wrong, and should never have been introduced into the Service. At that time, as the lecturer has said, we had no hard-coated bullet in existence, and the abandonment of that particular bore was not due to the intrinsic fault of the rifle, but to the fact that soon after it was put out for trial, Major Rubin, of the Swiss Artillery, brought forward a nickel-coated bullet which enabled us to go to a very much smaller bore. I quite agree with Captain James that the particular form of rifling adopted in that ·4-bore rifle was wrong. It was an error brought about by circumstances which I need not now refer to, but I was myself convinced it was wrong, and had that bore been adopted no doubt the form of rifling would have been altered. But the fact of the rifling being wrong is no condemnation of the bore of the rifle itself, and had it not been for the necessity of introducing a magazine arm to keep pace with other European Armies I think a rifle ·4 or ·38 would probably have been adopted as a single loader. There are one or two other points with regard to the lecture which I should like to draw attention to. The lecturer has said that he cannot understand why the rifling of the Lee-Metford should be left-handed instead of right-handed. I believe the reason for the adoption of the left-handed rifling was to counteract deflection. As he knows, deflection is always to the right, and it was thought that by giving the bullet a left twist on its leaving the muzzle of the rifle it would overcome the deflection which always bears off to the right. It used to be thought that a deflection was a straight line, that the bullet always went in a straight line; but it was discovered, at Lydd, I think, that a deflection was a curve, and that the greater the range the greater the curve. That was found out by firing vertically, when the bullet always came down in a curve. That is the reason why the sight is always set correct for one particular range. In the Martini the sight was correct at 1,000 yards, and as the deflection is always to the right it stands to reason that all between that and 1,000 yards went to the left. The left-handed rifling was adopted partly to overcome that deflection. With regard to swords being obtained from Germany, the reason we went to Germany was this: It happened when I was superintendent

at Enfield. It was not because we thought the Germans made better swords, but because English swordmakers could not make swords in sufficient numbers to stand the tests which have been laid down by the committee which met to establish the new pattern cavalry sword. Several makers were asked to send in swords to fulfil certain conditions. Mold, of Birmingham, was one, and Wilkinson was another, and Sheffield was also asked to compete. I had a letter from some of the leading cutlers in Sheffield absolutely declining to have anything to do with swordmaking. At that time swords were never made at Enfield, but I asked permission to send in swords to fulfil the conditions laid down, because I thought we could do it at Enfield if anywhere, and I believe the sword which was sent in from Enfield stood the test better than any others, and for many years that was the sealed pattern; it is, I believe, still at the War Office. The Sheffield makers would not undertake to make the swords, and so we were obliged to go to Germany in order that we might get sufficient swords to re-arm the whole of the cavalry regiments, because there were no swords in store at that particular time. With regard to the machine gun, Colonel Lockyer says he thinks they are still in a state of evolution, and that the Maxim is a complicated and difficult weapon to keep in order. He lays down certain conditions, the principal of which certainly is regularity of fire. I quite agree. I hope the Maxim will be superseded by a gun which I shall have the honour of sending up for trial in a very few days, and will fulfil the conditions which Colonel Lockyer has laid down. I think we are all indebted to the lecturer for the very interesting lecture he has given to us and for the immense amount of information he has supplied.

Colonel LOCKYER, in reply, said:—With regard to Colonel Gunter's remarks, that gentleman did not tell us what rifle he used at Hythe. He said that he preferred to shoot with a short rifle at short ranges.

Colonel GUNTER:—The old short rifle.

Colonel LOCKYER:—The Enfield, or the Snider, or the Martini-Henry? Because that makes all the difference. In the old times at Hythe the short rifle or the short carbine was an inferior weapon. I am perfectly aware of that. But nowadays the carbine is not an inferior weapon, and it fires the same cartridge, which makes it a different thing altogether. We fire the same cartridge with very much the same result. In the old time with the Martini-Henry you had a weaker cartridge, and must either have your shoulder knocked off or get inferior shooting. Colonel Gunter also said that he thought the long rifle would stand more knocking about than the carbine. I cannot see that. In the first place, the carbine is a nice, compact little thing, and there is less of it to be knocked about to begin with. You have a shorter barrel, and it is not so likely to bend. Therefore I do not quite see why it should not stand quite as much knocking about as the rifle. However, that is a matter of opinion. Mr. Formby mentioned iron barrels. Iron barrels were in use, I remember very well, with the Enfield. I do not think any new iron barrels were made in the days of the Snider. Of course, the old Enfield muzzle-loading rifle had iron barrels, and they were adapted to the Snider. Plenty of those had iron barrels, but I do not think any new iron barrels were made, certainly not by the Government after the Snider was adopted. Iron barrels were rather in favour among shooting-men, but I do not know why. I do think that the old wrought-iron barrels that we got then, in the old Enfield days, were much better than the wrought iron that we can get now. Captain James spoke of the Soper, I think, in connection with the Martini-Henry. The Soper did not cut out the Snider action; it was just too late to compete with it, and that was years before the Enfield.

Captain JAMES:—Was not the committee formed in 1870 which had the Soper before it?

Colonel LOCKYER:—It may have come on again, but I know it was just too late for the Snider.

Captain JAMES :—I merely say it is my opinion.

Colonel LOCKYER :—I think it was a most excellent one, but that was hardly a falling lock.

Captain JAMES :—Yes, it was.

Colonel LOCKYER :—I had an idea it was one which opened.

Captain JAMES :—One which opened with a lever at the side, and the block fell something like a Henry block.

Colonel LOCKYER :—It was a good action, and I mentioned it in my lecture. With regard to the ·4 bore, I do not quite agree with Captain James when he said that there was a heated discussion, and that if there had not been that heated discussion, and the ·4 bore had been knocked on the head, we should not have had a magazine. The magazine had been decided on long before the ·4 bore was knocked on the head, and if it had not been knocked on the head we should have still had a magazine rifle. With regard to the Lee bolt, we had a trial when that came out, and I have no hesitation in saying that the Lee bolt, or a very strong extraction of that sort, was absolutely necessary when we first began making the cartridges for it. There are those here who will remember that we had the very greatest difficulty in getting even a Lee bolt, which has a strong extraction, to work at all to begin with. I remember for certainly over a year we had, with some rifles, absolutely to hammer that knob round before we could extract the cartridge. That was because we had not the right alloy for the cartridge, and I do not think any weaker bolt would have answered at all. Many people agree with Captain James—a very large majority agree with him—that it is absolutely necessary to have a magazine, and I dare say, in order to keep pace with European nations, it *is* necessary ; but at the same time I, personally, do not like it. There are plenty of others who do. With regard to the cut-off, with our present magazine without the clip, it is most essential, because you have your magazine always in reserve. You put on the cut-off and still use the rifle as a single loader, and have the magazine in reserve in case of emergency, and that I fancy is why it was introduced. That certainly is what it is used *for*, and what it is *supposed* to be used for.

The CHAIRMAN (Rear-Admiral Lord Charles Beresford) : — Ladies and gentlemen, with your permission I will make a few remarks upon this most interesting paper. There have been some very practical ideas brought before this audience ; but the pith of the paper, as I read it, is that the lecturer thinks that it would be to the benefit of the nation to change the arm for the whole Service, more particularly for the infantry. I think if the carbine is practically proved to be better than the rifle, there is no doubt we ought to have the carbine, but I do not think the State ought to enter into so drastic a change without good reasons. I am not thinking of the expense, because I do not think that the expense should ever enter into any question with regard to naval and military matters ; what we want is efficiency, and the most effective weapon of any sort is the cheapest for the State. I myself do not quite understand the tests which the lecturer brings forward as proving the carbine is the better, because it is totally subversive of everything we have ever done with heavy guns. Our object is to get a long gun so as to burn the whole of the powder, and better practice has always been made with the long gun than with the short gun. There is, again, the question of sights being close together, which would make a difference to any man firing at an enemy. But the man who fires at a target is not always the best shot in the field. What we really want in our Army, and, of course, in our Navy, but the Army particularly, because in any campaign the ultimate issue must rest with the infantry—what we want are good shots. We must have the best weapon we can put into their hands, but that is absolutely useless unless the men know how to use it. Any military man here will agree

with me that he would rather have a small force of good shots than a large force of bad shots. You do not want to mince matters in action; you want to kill as many men as you can and end it, and if the enemy begin to kill your people it certainly disturbs and distracts the aim of many other men who are good shots. Actions will be won by the best shots, as was exemplified by the Austrians and the Germans in days gone by. Of course there are great advantages in what the lecturer says about the carbines. They must be handier and lighter and enable a man to do more, especially in relation to the wars which this Empire is always mixed up in, in the bush and places of that character; and if the carbine is as good as the rifle in practice, I believe it will be the best weapon to have. But I think everybody here will agree that such an enormous change ought not to be carried out without a most complete practical test being first made in the field; if possible, with a regiment or regiments. Then the lecturer brought forward the question about the old bayonet and the new knife-bayonet. I cannot understand why that knife-bayonet was ever introduced. I suppose there are many men here who have gone through a sport called pig-sticking, and everybody knows that if you have a flat spear you cannot get it into the boar at all—either the surface is more exposed or the cutting edge is much less. A bayonet boar-spear goes in with the greatest ease, and, as the lecturer says, it comes out with the greatest ease. Again, it is no use mincing matters. If you have a Britisher going to fight another man, he wants to get the bayonet in him as quickly as possible. If he has a weapon which will not go into the other man, his chances of defeating his enemy are less. Then again, I like a long bayonet much better than a short knife. It is not at all a bad arm used singly without being at the end of the rifle. Again, the lecturer referred to revolver shooting, and I entirely agree that you want a revolver which will fire its four or six bullets as soon as it can, and stop a man. As for stopping to load it afterwards, anybody who has ever been in a hot action knows that that is all nonsense. Fire off your bullets, and then, if that does not do, hit the man with the butt of the revolver on the top of the nose—if you can. As to reloading it, it is absolutely absurd. Then there were some remarks made by Captain James with regard to the Magazine rifle. I cannot imagine why anybody, with great respect to the lecturer, should oppose the Magazine rifle. What you want to do is to hit as many as you can. When you have accuracy, as you have with modern weapons, you want to use your weapon as many times as you can, and that you are enabled to do with a magazine rifle, with a Q.F. 6-inch or other similar gun. I quite agree with Captain James in his opinion that the clip with five cartridges is certainly better than the one we have. I went to one of the German manœuvres, and was very much struck by the quickness with which the men could attach these clips, and I think it would be very much more efficient than the plan which we have at present. Colonel Gunter made some remarks about fighting with a bayonet or with a sword. I do not know who could have designed such a weapon, for of all the clumsy, useless weapons that ever were designed, the cutlass that we fixed at the end of a rifle and gave the bluejacket was the worst. There never was such a weapon. It was enormously heavy, it had a great basket hilt of steel, and I can only tell you that in the Soudan my men continually asked me if they might leave their cutlasses in the sand, and whenever any poor soldier was killed they invariably changed their cutlass for the sword-bayonet, because the cutlass was so awkward; the basket hit their elbows, and if they were marching along they were always tripping them up. As a bayonet it was absolutely useless. I should like to point out that in engaging a man with a sword or a cutlass, one point is worth ten cuts, and the great thing is to teach your man to guard himself, and whenever he can to get in the point. With regard to the machine gun, I have the greatest belief in it. I have been lucky enough to be on service with it, both on shore and afloat, and have always regarded it as a good weapon. I remember many years ago I was impertinent enough to give a lecture here,

which was principally attended by officers in the sister Service, on "The utility of machine guns in the field." I look upon them as being the same on shore as torpedo-boats are at sea. If it is successful it is enormously successful, and if you lose it you do not lose much. It represents a cluster of rifles; it is not a gun at all, it is a cluster of rifles and like a company of infantry, only that it has no nerves and presents no target; if you lose it you lose very few people. I believe there will be great improvements in the machine gun. The first which was invented very often jammed, and we lost a great number of lives with them; but the Maxim gun, I think, is a very successful one. I am delighted to hear that there will be an improvement on the Maxim. I remember seeing the Nordenfeldt, which I thought better than the Gardner, because the Gardner, being a rotary machine gun, if any part of it went wrong the whole of the gun went out of action. It was not so with the Nordenfeldt, and I thought the Nordenteldt was the best. I remember telling Mr. Nordenfeldt that I would do all I could to get his gun into the Service, but that if there was an improved gun I would do all I could to get *that* in. I must say that I think it would be very hard to get a better gun than the Maxim. Then with regard to the steel tests, I entirely agree with the lecturer. I do not think we go the right way to get steel at all in the Government departments. I believe the best thing would be for only one officer to know what the different samples were, and for him to put the samples to the test and then find out about them. I am quite satisfied that the Government often pay prices for their steel which are less than the ingredients which are necessary to make good steel; and when you come to the question of prices, it is not because the price is the cheapest and the tender is the lowest that it is always going to be the most useful thing for the State. There was another point which the lecturer brought forward which I am sure we all agree with, and that is, that there should be a universal pattern for every arm in the Service; everything should be interchangeable, and that should be so more particularly with the machine gun and the ammunition. I am sure I shall be carrying out your wishes in thanking the lecturer most warmly for a most interesting discussion, which I hope will bear good fruit, as most of the discussions in this chamber do.

THE WORKING OF THE ROENTGEN RAY IN WARFARE.

By Major W. C. BEEVOR, R.A.M. Corps, Surgeon-Major 3rd Bn. Coldstream Guards.

Surgeon-Major-General J. JAMESON, M.D., C.B., Q.H.S., Director-General Army Medical Department, in the Chair.

PERHAPS the most interesting addition to surgical science of late years is that which has endowed us with the power of investigating, by ocular demonstration, the condition of the interior of the body, whereby we are enabled to determine the position, size, etc., of foreign bodies which may have been adventitiously introduced into the tissues, and also observe the condition of injured bones, joints, and internal organs. Doubtless you are all by this more or less acquainted with the effects of that truly astonishing element, the X ray, a name modestly applied by its illustrious demonstrator, Professor Roentgen, to whom surgeons in particular, and the world at large, owe an inestimable debt.

The object of this lecture is to give my experience in the working of this curious element, the X ray, in military surgery, and through the universal kindness of many official friends I shall be able to give you the results of its employment on the recent Frontier Expedition in India, and then to lay before you some modifications in the construction of the appliances for generating the X ray, which have suggested themselves to me after working amongst the wounded on the field of battle and its adjacent hospitals; and I humbly beg your criticism of them, in the hope that some useful advance in the science may be originated, and additions made to our efforts towards alleviating human suffering, thus showing our craft to be still striding onwards and making laudable efforts at deserving the kindly praise bestowed upon it by the Secretary of State for War, Lord Lansdowne, in a recent speech in the Senate, and proving that we surgeons of the present day are aiming—as our illustrious forefathers ever aimed—at placing at least one more niche in the Temple of Æsculapius.

It is not within the province of this lecture to attempt a description of our knowledge of the nature of this wonderful element; I merely beg

to lay before you some of the most interesting results of its powers as applied to military surgery; and as I see both non-professional and professional friends have kindly come to give the subject their attention, I will make my best endeavours to describe the cases with as few technicalities as are conducive to clearness of demonstration.

As many may not care to go into the details of construction of apparatus, I will first exhibit some of the pictures taken during the recent Frontier Campaign, and give a short description of each, in the hope of entertaining those who would rather not wait for the consideration of what one may call the engineering or mechanical section of the subject.

I propose to show you, by means of the magic lantern, a few cases of interest which were taken during the Frontier Campaign. Amongst the first was the following one.

Case I.—This is a representation of the knee-joint. It shows the lower end of the thigh bone, and the upper ends of the two bones of the leg; also a piece of the knee-cap, the whole of which did not get into the area of the photographic plate. This patient was shot up in the thigh, the bullet apparently struck the lower end of the thigh bone and rebounded in a new channel made by itself; the interest attached to this case is that a probe passed easily down to the bone, but no evidence of a bullet could be got, the X rays however showed it to be about half an inch beneath the skin of the hollow of the knee. The case is also of interest in proving how a bullet made of soft lead can be flattened when striking a bone; for here you see a soft lead missile having struck the bone, been defeated by it, and lying with its flattened face towards its conqueror. Imagine our disgust when we discovered this long-sought-for trouble had been smiling at us within half an inch of our fingers!

Case II.—Here is a case where a bullet had travelled down from the middle of the thigh to about 2 inches below the knee-joint. This is a representation of the upper part of the leg—the bullet had entered the thigh about its middle-third, and simply been lost. It had evidently wound its way round the thigh, behind the knee-joint, to the point where you see it in the picture. You will notice its irregular outline, it was in fact a ricochet; another point of interest regarding this case is, that the patient at first would not consent to an operation for its removal; he was a native soldier of the Gourkha Regiment; he was sent to the base hospital at Rawal Pindi, where I saw him in January last; he had been in bed from October 20th, 1897, having been shot at Dargai. We examined him again at Pindi, and found the bullet had moved about an inch; he could not walk on account of the sharp edges of the bullet causing great pain and irritation in the tendons or sinews with which it was surrounded; after removal, however, he rapidly recovered.

Case III.—Here is a bullet lodged in front of the elbow-joint—the picture shows the lower part of the bone of the upper-arm, and the upper ends of the two bones of the fore-arm. This man was shot about the middle of the inner face of the upper-arm; no trace of the bullet could be made out; the wound healed well; the man was sent on two months' sick

leave; on return he applied for a pension, being a native soldier; his complaint was that he could not extend the arm to its full extent, it seemed to lock suddenly, when the joint had got at the angle shown in the picture. It was by mere chance that I saw the case, as he was suspected of what we call "piling on the agony" a bit to get a pension and go home and be married; however, here was the whole of a Martini-Henry bullet lying on the face of the joint; we could not feel it even when we knew its exact position. The round tendon, which you can all feel on the front of your elbow joints, overlapped the bullet, and the latter had by this time become so closely embedded within some muscular fibres beneath that it was impossible to feel it. The medical officer who removed it next day told me it took him nearly half an hour to separate this bullet from the fibrous material with which it was so tightly entwined; suffice it to say that the man was not "humbugging" and soon recovered.

Case IV.—Here is a representation of the foot. The chief point of interest attached to this case is that it demonstrates how small a foreign body will sometimes render a soldier incapable of performing his duty. Now the small body I refer to is that little angular black spot situated just under that prominence of the heel-bone, it was not more than a quarter of an inch in diameter, in shape triangular, and embedded in the sensitive covering of the bone, professionally called the periosteum; this membrane is full of nerves and blood-vessels; the case was that of a sergeant, a valuable and good non-commissioned officer; he had been shot on the upper aspect of the instep, four small pieces of metal, probably telegraph wire, had been extracted; the wound healed rapidly, but on attempting to walk he experienced a sharp stinging pain running up the back of the leg—for about six weeks he had tried to walk without success; the X rays showed the cause of his disability, and after its removal next day I believe he made a rapid recovery. I must explain to those who are not conversant with the anatomy of the heel, that the tissues covering this part are composed of very dense cellular material, within which it would be almost impossible to find so small a body without accurate localisation.

Case V.—This is rather a difficult case to demonstrate, yet it is one of intense interest. The soldier was a Sikh, one of two who were shot when bravely defending their regimental transport mules at the point of the bayonet; night had overtaken them, and they were rushed at close quarters when in a river bed, they had put on their warm coats, which are composed of badly cured goat-skin, the long hair covers one face, the tanned skin forms the other; one man was shot in the thigh, the other in the elbow; on the third day both showed symptoms of rapid blood-poisoning; several attempts had been made to extract the offensive bodies, but the limbs had become so much swollen and so many pieces of sloughing tissue had formed, that numberless tracks led from the wounds; it soon became evident that the cases would die from septicæmia or blood-poisoning, unless the limbs were removed, and even with this drastic treatment the issue was doubtful, on account of the flaps being composed of poisoned mortifying tissues. The X rays, however, localised the

offending bodies. Here is the one from the thigh, you will see how closely the bullet was wrapped within this covering of skin and hair; both were very offensive when removed, but by dint of careful antiseptic treatment the cases recovered rapidly, and three months afterwards I had the pleasure of hearing from their illustrious commanding officer, Colonel Des Vœux, of Fort Gulistan fame, of their restoration to duty; he was particularly pleased with their recovery, as they had distinguished themselves at the noble defence of that Fort, one being the sergeant who led sixteen men against overwhelming odds, and captured three of the enemy's standards at the point of the bayonet.

Case VI.—This case is one chiefly of surgical interest, at the same time, however, it has a romantic touch of reality, being the leg of a general, the very brave and able General Wodehouse. Its surgical interest consists in demonstrating the fact that not only bones, but fibrous tissue, commonly called gristle, will sometimes split a bullet, or chip pieces from its surface. The bullet entered the leg in its upper third, passed obliquely downwards, and was cut out on the opposite side of the leg in its lower third, having in its course passed through the space which you see exists between the two bones; this space is filled in by a tough fibrous membrane, and as the bullet pierced it, you see the membrane cut four pieces off its surface; there they are lying on the same plane, sticking in the membrane. The other point of interest in this case is the proof it gives us that even a jagged wound, such as this, does not of necessity cause intense pain, for General Wodehouse would not be laid up for long, and shortly after the injury was received he rode into Peshawar at the head of his brigade with the wound still unhealed. What you see in the upper part of the picture is a safety pin, for I may as well explain that it is not necessary to remove dressings or splints when taking pictures with the X rays, for they will pierce all such material.

Case VII.—Here is a case of intense interest, and one of great surgical value. It is that of a Gordon Highlander, who was shot at Dargai. The bullet entered the groin from the front, passed backwards, and was flattened out against the wing-like portion of the hip-bone, which spreads outwards from the spine; in that situation you see it represented in the photograph (picture A), and, as this picture was taken with the photographic plate lying against the spinal aspect, you see the bullet through the bone. A point of great surgical value in this case is, that for some reason or other the man thought the bullet had come out after hitting him. Many times was it searched for with probes, but to no purpose; a probe could be passed directly backwards for about 6½ inches. When I first saw this case in the base hospital at Rawal Pindi, about three months after receipt of injury, the man looked wasted, and there was a constant discharge of matter from the wound, also signs of an abscess in the hollow of what we call the pelvic cavity; this was gradually contracting the muscles which pass from the cavity to the thigh, and, consequently, the latter had become flexed on the body. I suppose that on account of his weak condition an operation for the removal of this offending body was not performed at once, and the next time I heard of the case was from Dr.

Mackenzie Davidson, who had been down to Netley on a visit to his friend Professor Stevenson; they had taken a picture of the case from the front aspect, and I show it to you now (picture B). You will see it is our old friend of the first picture, not altered in shape, but having changed its position. Evidently portions of bone had been killed by the blow of this bullet, and, subsequently, by its irritating presence, had become loosened and fallen away, thus letting loose the bullet, for it had fallen forward into the position you see it in picture B. One proof of this fact is that a probe would reach it at about 3 inches from the surface, whereas when seen at Rawal Pindi the probe passed 6½ inches backwards. Dr. Mackenzie Davidson heard from Professor Stevenson that when he cut down upon this bullet it was found lying loose in the cavity, and I surmise that an abscess had been formed out of the *débris* of the dead bone, and had gravitated downwards, and that the bullet, when loosened, had fallen down into the abscess cavity.

Cases VIII. and IX.—Here is a curious "splutter," I dare say you may call it. I have chosen it to show you how a bullet can be split up into many pieces by even small bones, for it is the hand of a Sikh soldier; he was shot through both hands when in the act of firing his own rifle. Some sporting shot amongst the Afridis evidently saw the Sikh "drawing a bead" on him, so he must have done the same and got first pull, as the bullet passed straight along the line of the Sikh's rifle-barrel, passed through both hands, entering each exactly in the position of the middle finger—here is the right one—there were seven bits of lead at first in this hand; some were removed after our first photograph, and this is a subsequent one, taken to discover the state of affairs. You will see how the supporting bone of the middle finger has wasted away almost entirely, and that the finger has fallen back, becoming the shortest in place of being the longest digit. Thus this case is one of the many which illustrates the value of the X rays in showing us how matters are progressing in wounds, and guiding us in treatment.

Case X.—This curious object shows what a smash-up a bullet may make in some parts of the body; it is the hip-bone of a native soldier. He had been wounded some time before I saw him, and an enormous lump of calloused bone had formed. Some of it was not fully developed bone, and consequently does not show so deep a shadow as other parts, so that the point of interest here is the representation of growing bone. On the inner and lower side you see this round object, which is the bullet.

Case XI.—In this picture you see what, in all probability, would have caused permanent disability to the man affected. It is a knee-joint, and between the bone of the thigh and that of the leg, and beneath the knee-cap, you perceive some irregular pieces of lead. Now when the joint is extended to the full, these three bones approach one another so as to come almost entirely in apposition. You can see that the joint in the picture is somewhat flexed or bent, and that when extended, and the bones approximated, they would squeeze these pieces of lead between

them; in so doing, the sharp edges of the metal would be pressed against the sensitive surfaces of the bones forming the joint, thus giving rise to much pain and irritation. This is precisely what was taking place; the patient could get the leg extended to the position shown in the picture, but when beyond that point he experienced a sharp pain in the joint, which prevented movement. No amount of probing could have localised these bits of metal, situated as they were within the fibrous material covering the joint—and the observation of their size, number and position, as you have demonstrated here, is the only method of research that could have enabled a surgeon to remove them.

Case XII.—I show this not as representing anything of surgical interest, but to let you see a somewhat curious result of X rays' work. It is the hand of an officer who was shot whilst wearing a pair of leather gloves; some portions of glove were carried by the bullet into the hand, and gave rise to local blood-poisoning; much swelling took place, and you see this represented in the picture; but what I want to call particular attention to is the distinct image of the plaster which encircles some of the fingers; at the time the skiagraph was taken there were several running sores due to blood-poisoning; these being painful, it was necessary to leave all dressings on the hand, even a flat wooden splint, and thus this case shows you how the X rays enable us to examine the condition of the interior of limbs when the patient cannot bear to have the part unsupported; the reason you see those rolls of plaster so distinctly marked out from the rest of the dressings is that lead forms part of their composition, and consequently renders their substance much less porous than wood, etc.; hence the X ray has cast a deeper shadow in passing through them. A point of surgical interest attached to this case is, that we feared some of the bones had become involved in the destructive processes taking place, but by this picture we were re-assured, for their condition is shown to be healthy; at one time it was quite a question whether it was not the most advisable proceeding to amputate this hand, and the satisfactory condition of the bones added greatly to the resolution in favour of conservative treatment.

Case XIII. A and B.—A question of much surgical importance was decided in the investigation of this case. I show you two pictures, the first taken a few weeks after the receipt of injury, the second about six weeks later. It is the hand and wrist of an officer who was shot through the lower part of the fore-arm and wrist; great destruction of the bones and joints occurred; in the first picture you will see that there appears to be three long bones in the lower part of the fore-arm, but the two on the thumb side are really portions of one bone that had been split by the bullet, and the joint between this bone and the wrist was fissured; now examine the picture B, and here you will see how completely these two portions have come together, new bone being thrown out, the joint surface levelled, and in all probability a useful joint will result from what former surgical precepts considered a hopeless case. In picture A you will also notice a good deal of spotting in various situations; this spotting represents portions of dead bone that have been thrown off from the injured and

dying surfaces; in picture B you will see these have disappeared, the dead bone having been cast out of various openings, and as Nature renovated the dying surfaces these spiculæ were no longer detached; thus this case demonstrates the great recuperative power of bony tissue in an otherwise healthy subject; a few dark blotches can be seen encased in the lower end of the fore-arm bone, these are splashes of the bullet, and since the new bone seems to be growing satisfactorily they are being gradually encysted and will probably not cause any further trouble. When I last saw this officer he was begining to recover some movement in that joint which had been so completely fissured, thus giving us sound hopes of recovery and the pleasure of watching its progress, in what at first appeared a hopeless state of affairs.

Case XIV.—Here is another instance where I think we may fairly claim success for the X rays. It is that of an officer of the 3rd Sikhs, who was shot in the chest at the attack on Dargai. The bullet is supposed to have struck the breast-bone at an angle and to have been split by the dense bony tissue. To all appearances the bullet had passed out a short distance from where it had entered. But in spite of a magnificent constitution and brilliant health this officer did not progress so well as the medical officer in charge could have wished; there was some rise of temperature, cough, etc., which symptoms always give rise to anxiety when connected with the chest. I was asked to examine the case with the X ray, and found what you see here. Just beneath the second rib on the left side you perceive a round dot. Now to a professional eye it was evident that some foreign body of a non-porous, probably metallic, nature was situated there. I had to proceed further to the front early next morning, so I was dependent on the report of Surgeon-Captain Bates, A.M.S., his able medical officer, for the further history of this black dot. In effect it was that he cut down on it at once, finding what was evidently one end of an irregular piece of metal. It was extracted with some little difficulty, being about 1¼ inches long and twisted on its own axis, with some sharp points protruding from its edges. There was also some pus or "matter" surrounding this foreign body. After removal the patient progressed very satisfactorily, and returned to duty with his regiment. Now to anyone conversant with the anatomy of this region it is evident that had this foreign body not been discovered and removed there must have existed great danger of an abscess being formed, and in its development have caused complications of a very serious nature, for matter will travel very rapidly in this situation, either by gravitation into the sac surrounding the lung, or by a destructive process, eating its way into the lung substance. By so doing it might have lighted up a purulent inflammation of the lung and other serious complications, which it is needless for me to enumerate here. Doubtless several attempts had been made to discover whether any portion of the bullet was present near the seat of injury, and without success. This can be readily understood if you examine the picture, for to pass a probe along an irregular channel is always difficult, but to succeed in hitting off the pointed end of a foreign body like this, when wedged between two ribs, is practically impossible,

and you might grovel about for several times without hitting it off, most probably never attaining this end; besides there existed only the probability of a foreign body, so no one would have been justified in trying several times, hence the danger of the complications above mentioned. In all probability some portion of this bullet had passed outwards, and this remaining bit had travelled backwards between the first and second ribs.

Case XV.—In spite of my time being up, and the eye of our august Secretary on me, I must show you this triumph of what we call a powerful X ray; the case is also one of great anatomical and surgical interest. A bullet entered the right side of the chest at a point in the lower end of the arm-pit; it had penetrated the substance of the liver, but where it had gone afterwards was a mystery. The man had suffered a good deal from shock at first, and all the disagreeable conditions attending a wound of the liver, but he was regaining strength when I saw him; there was, however, a large open channel passing far into the liver substance, but no bullet could be discovered by probing. I tried to find it in the liver with the X rays, but failed, and in desperation had a peep at the other side of the body, finding what this picture shows you. Just in the centre you see a round black object; that is an ordinary round bullet, such as the Afridi fires from his native-made gun. It is perfect in shape, so evidently did not strike a bone, but the great interest attached to this case is that one would regard it as impossible for such a body to pass from one side to the other in this part of the abdomen without causing some fatal injury. I may tell you that in its track it must have passed between many vital organs, enormous blood-vessels, crowded together in a small space, and several nerves endowed with vital functions, any one of which would, if wounded, have caused a fatal issue. The picture is taken in the centre of the left loin, the bullet having entered on the right side of the chest.

When organising any apparatus or materials for use in warfare, one has to consider many details peculiar to the special work the apparatus may be engaged in, so for convenience of description I propose to divide this portion of the lecture into the following headings:—

1. The best form of apparatus for military work.
2. The safest means of transport.
3. The difficulties met with on and near the field of battle, and the means of overcoming them.

Now I think you will agree that one great desideratum in the construction of all apparatus for military work is, that they should be what one may call "get-at-able," thus enabling us to renovate the inevitable defects of wear and tear; every portion of our apparatus should undoubtedly be easy of access, the coil, the condenser, connections, etc., should all be packed in cases that can be opened and inspected at a moment's notice, without the necessity of special instruments; there should be no looking about or sending for particular screwdrivers, wrenches, etc., no hurrying or flurrying of attendants; the operator should be independent of help; and with a view to obtaining this desirable condition the Medical Department of our Army has spared no expense

or trouble, having after due consideration ordered the apparatus which I now place before you.

This is the apparatus: I hoped to have shown you one of greater dimensions, but the manufacturer has been unable to complete it in time. This is an exact representation of the apparatus which the Medical Department forwarded some time ago to Egypt, and I may as well tell you that even after all the consideration, and all the trouble which has been taken, there are many details which the manufacturer acknowledges can be improved even in this apparatus. The fact of the matter is of course that this science is only in its infancy, and the more we go on learning the less we find we know. However, there is no doubt that this is an apparatus which, if carefully managed, should work successfully. You see it is not a very bulky one; the whole thing is enclosed in this box. It is made by Mr. Dean, of Hatton Garden, and he has shown a great deal of ingenuity in its construction, and a great deal of care and trouble in its manufacture. I do not think it is necessary for me to go into the details of the ordinary construction of this apparatus. Suffice it to say that beneath here we have an apparatus for the generation of the secondary current of electricity which is essential for producing this X ray. Here you will see a most ingenious stand which, when taken to pieces, will fold up and can be carried in this drawer. This stand will bend in any direction downwards on any side, and so on, and you can also bend this tube in any direction.

[Apparatus described.]

Mr. Cossar, of Farringdon Road, supplied me with only three tubes. He said he thought that they would work, and work they did. They were used in more than 200 cases in Tirah; they went through all the rough transport country, and they landed back at Rawal Pindi, in January, in as good working order as when I took them out, with one exception, and that was that we found a tremendous difficulty in working with the delicate electrical connections of these tubes. Here is a broken one, I unfortunately let the box lid fall on it; it was a folding box, and the lid fell on the tube. Here you will see what sort of make-shifts people have to design when they are facing the difficulties of military work. This tube was my best; it had taken that chest case, the hip case, and four or five other very interesting ones. This was a case which this tube had taken with extraordinary intensity, and with wonderful purity of X ray; and to my utter disgust, one day I was trying it in a difficult case in a tent, and the wind blew the flap of the tent in and broke the connection away, and there was my best tube gone! However I am much indebted to a most excellent and kindly scientific man, Mr. Dalby, of the Indian Telegraph Department. He and I rubbed our heads together, and scratched them in various ways, to see if we could not renew this little tube. He said:—"I think if we were to make a sort of cap of some material, we might do it." Well, I set to work, and he got what is called Chatterton's Compound, which sticks to glass, from the Telegraph Department of the Engineers, and put a spiral coil of wire, connected it with the broken ends of that terminal, covered them over with Chatterton's Compound, and that over

with sealing-wax, and to our great joy we found our tube worked just as well as ever. There are many difficulties which, anybody who works with military apparatus, will have to encounter. I was going to describe them in a little more detail, but time will not allow.

Yet there is one very important subject, that is, the most desirable means of transport for our apparatus.

Whilst introducing this subject I beg to point out that it is not only possible but quite easy to have an X ray apparatus working at the front; further, also that the cases already exhibited contain indisputable proof that even in savage warfare, where the Geneva Convention is unknown, the X ray can be brought under control, and an immensity of human suffering obviated; it is not necessary that every field hospital or bearer company should be supplied with an apparatus, as it can be readily transported from one part to another of the field of operations. I feel sure you will see what an advantage it is to be able to localise bullets, and other foreign bodies, without the painful process of searching with probes, and that a threefold advantage is gained in the treatment of our patients by this means: first, the absenceof any pain or physical injury; from which arises the second advantage, in cases where there has been much loss of blood or injury to bone, we are enabled to ascertain the exact condition of affairs without the risk of increasing the depression of our patient by operation, and we thus give him the best chance of re-action, upon which depends his recovery. Who indeed has not seen on active service many a case where the vital powers have held out to their last flicker, and are probably being supported by a cheerful and magnificent heroism on the part of a brave man, where, with proper means at hand, the surgeon has been enabled to fan that last flicker into restoring flame, which he would have been powerless to accomplish without scientific aid—and who with much experience of active service has not gone through the indescribable chagrin and sorrow of witnessing the converse! Therefore, ladies and gentlemen, I maintain it is now the duty of every civilised nation to supply its wounded in war with an X ray apparatus, amongst other surgical aids, not only at base hospitals, but close at hand, wherever they may be fighting and exposing themselves to injury in the performance of their hazardous duty. After trying every kind of transport in India—mules, camels, wheeled vehicles, etc.—I came to the conclusion that by far the safest and most satisfactory in every respect is human transport. Coolie labour can be obtained in most places, and where not, any European could be employed. As the portable apparatus should not weigh more than from 80 to 100 lbs. two men are all that is required for the moment and a reserve of two more, with reserve equipment, complete the transport I beg to exhibit for your consideration; a bamboo pole or hollow steel bar of about 6 feet in length, is what I found the best construction from which to suspend the boxes; each end of the pole is carried on the heads or shoulders of the bearers, and the boxes are slung from the pole. In Tirah I employed a disused Dhoolie pole and Dhoolie bearers to convey my apparatus; they willingly volunteered for the service, and carried the whole apparatus from Bagh Camp in Tirah, down the defile

to Dwatoi, and down the Bara Valley to Peshawar, without injury; parts of this march were beset with difficulties seldom experienced in any kind of warfare, and yet these faithful followers landed their charge in good working order, at a time when it was sorely needed. It may interest you to see a few photographs I took during this march, as they will serve to show the difficulties of transport in such a country; yet photography cannot adequately exhibit the conditions, for rocks, icy-cold water, rapid torrents, frost, and snow do not come entirely within the grip of our photographic lenses. Mules, camels, and wheeled transport are too uncertain conveyances for delicate materials, except of course where we have good roads and plenty of room; but our military apparatus should be independent of these luxuries, and it seems to me that this transport fulfils the necessary conditions.

[Magic lantern slides were here shown illustrating the difficulty of transport.]

In the third part of this section I will give you what appeared to be the difficulties specially involved in working the apparatus at the front. The generation of our primary current of electricity is at present a very serious consideration. The only means I had in Tirah was a heavy and cumbersome primary battery, worked by a mixture of bichromate of potash and sulphuric acid; the latter is too dangerous an article for military transport, unless accompanied by someone who will look specially after it. I ran out of the supply in Tirah, the railway company refused to forward more, and I had to gather together the few ounces carried in the equipment of the various field hospitals. I, therefore, condemn this form of battery for field work, and beg to recommend the employment of a hand dynamo and portable accumulator. This combination has many advantages; in the first place, it will stand rough transport, and should one get out of order the other can be substituted. Thus, if the accumulator is run out or injured, the dynamo can be used to give sufficient current for most cases; with an army in the field there is always plenty of hand labour for this purpose; and again, if the dynamo is out of order, the accumulator can be charged at the field telegraph station.

We shall often experience a good deal of difficulty in examining cases in the open air or in tents from conditions of climate; hot sun, rain, frost, snow, and wind, all militate against a good result; the baneful effects of hot sun are chiefly seen in the condition of the wax which insulates the wire of the secondary coil; should this melt, the coil becomes useless. We have experimented and found that the mixture of paraffin wax and resin in which this coil is embedded [exhibit] will not melt until the temperature is raised above about 150° Fahr. which should be enough for all practical purposes; this covering of felt [exhibit] also protects it from sun, rain, snow, and frost.

I experienced much annoyance from high winds when working in the open or in tents—the delicate platinum terminals of our ordinary Crooks tubes were constantly breaking from the strain of the shaking

wires, and I had to strengthen them by embedding them in this cap of sealing-wax [exhibit]; but Mr. Dean has devised this vulcanite case [exhibit] for each tube, which seems to get over the difficulty.

Another matter requiring special study for military operations is the quality of our "connecting" and "lead" wires; I tried several patterns, and found they all leaked at times, especially in damp, hot weather, and the one which gave the best results is this common thick telegraph wire —its insulating material of rubber, wax, and hemp, is far more serviceable than any of the fancy silk varieties.

Regarding the use of the fluorescent screen at the front, I must say it seems to me to be the most important part of the apparatus for urgent cases; by its means we can explore without delay the whole body, and its condition is therefore a matter of much importance. I am indebted to Mr. Le Couteur, of the London Photographic Association, for the suggestion of protecting its surface with a layer of celanite, and having the whole enclosed in an aluminium case [exhibit]; this protecting layer of celanite is most important, for no matter how careful one is the surface is liable to be scratched, and you will find that in military surgery your operations have frequently to be conducted under conditions of temperature where perspiration, like the babbling brook, flows on for ever, and soaks through everything porous; besides the danger of the enthusiastic onlooker, who in his laudable delight at discovering the shadow of a bullet on the screen, seems quite unable to resist the temptation of diving his finger at the inoffensive shadow of the offending bullet, and from climatic as well as preventable causes the military finger is not always chemically inert.

Regarding the employment of glass photographic plates for taking radiographs, there is of course the danger of breakage in transport. I broke many, but after trying films, bromide papers, and Messrs. Eastman's X ray papers, I came to the conclusion that we have not yet arrived at a satisfactory substitute for glass—the gelatine on films is very apt to deteriorate in hot damp weather, and I was not successful in obtaining good pictures with Messrs. Eastman's X ray papers, though it was probably due to my want of practice in their development. It would undoubtedly be a great advantage to discover an unbreakable basis for our sensitive photographic film, but I must confess I have not seen one yet, though we are working diligently to discover the much-needed element, and hope soon to succeed. I cannot let this matter pass without paying a tribute of high appreciation to Messrs. Paget's XXXXX plates—I had three dozen at the commencement of my venture in Tirah, and through all the adverse conditions they worked admirably, giving at the end of four months' rough travel as good results as at the beginning.

In conclusion, ladies and gentlemen, I beg to thank you for the honour you have done me by your patronage, and ask you to overlook the many defects incidental to the exposition of a scientific subject which is only in its infancy, and in the knowledge of which I am but a humble tyro, though I trust we shall now get the benefit of older and more experienced heads than mine, and thus gain some useful hints in what I venture to assert is a most interesting subject.

Lieutenant H. O. MANCE (R.E):—Anyone who has attempted to travel about in England with a complete X ray equipment will appreciate the difficulties of transport which must have occurred in the Frontier Campaign. I am inclined to think the author is rather sanguine when he says the weight of the complete portable apparatus will be from 80 to 100 lbs., especially if an accumulator battery is included. I entirely agree with the author in his condemnation of primary batteries except on an emergency, and I would go even further and be inclined to trust to the hand dynamo alone as a source of electrical energy on service. It would be interesting to know what maximum power the author found it necessary to provide for. Allowing 10 per cent. loss in the gearing and 40 per cent. in the dynamo, one-man power would generate about 37 watts. A dynamo capable of being worked by two men would probably provide ample power. The above estimate assumes that the power is applied to a winch handle. If leg power is used, probably about 30 per cent. more power would be obtained. With regard to accumulators, those of the ordinary liquid types are objectionable on account of:—1. The acid contained by them. 2. The excessive weight. For instance, the traction cells by well-known makers of Faure-type cells have a capacity of 7·5 watt-hours per lb. of gross weight of cells in ebonite boxes. A battery capable of giving an output of two-men power for five hours as estimated above (370 watt-hours), would weigh about 50 lbs. When a teak case is included and allowance is made for the diminished efficiency of small cells, the weight would probably be found to be over 80 lbs. Even if a second set of cells were not considered necessary for use, while the first set were being charged, a few reserve cells would also have to be taken to provide for the deterioration of the plates. This latter is a most uncertain factor, especially in the Faure type of accumulator, if the cells are worked beyond their rated maximum output or allowed to run down, a by no means improbable contingency during an important examination. The Planté type seems to be best for large output and small capacity batteries. Of dry storage cells very little is at present known, but it is somewhat doubtful whether any reliable and mechanically strong battery exists under 50 lbs. weight, which would furnish the above output. To be able to dispense with this weight might be an important consideration. There would be a great deal of trouble occasioned and time and energy wasted in charging the cells from the hand dynamo or at the field telegraph station. It seems to me that secondary batteries are only advisable where there is some ample continuous current supply available for charging purposes, and even then only when the supply itself is not available for direct use. A hand dynamo, on the other hand, if well made cannot be overworked owing to lack of power, and could be constructed to stand almost any amount of rough usage and to facilitate porterage. To use the available power to the best advantage the resistance of the armature windings and series field coil of the dynamo should be as low as possible. There must be a shunt field winding to maintain the field during the break in the main circuit. A magneto-machine would be simplest, but probably too heavy. A hand dynamo might possibly furnish a current not sufficiently steady for screen work, but I think a little practice would get over this difficulty if it exists. In the unlikely event of a failure, batteries might possibly be temporarily borrowed from the R.E. and used direct without the loss of power which would be occasioned by charging accumulators. The employment of someone on the staff skilled in instrument repairing would minimise any delay due to breakdowns of apparatus. With regard to the use of Eastman's paper, besides being less liable to damage it would have the following advantages over plates:—1. It is lighter. 2. It requires less operations to get a finished print. 3. More than one print can be taken, if required, at the same time. 4. The result is a positive and consequently represents the object in the right position. The ordinary prints from a plate are negative prints and show the image reversed. However, though some good skiagraphs have been taken on this paper, my experience bears out that of the

author that they are not so good as plates, given equally favourable or unfavourable conditions. Films possess all the advantages of paper over plates, for positive prints can be obtained from them by printing through the films the wrong way. They will most probably supersede plates in warfare. I have always used Cadett's "Lightning" plates with "Velox" developer, and find they give very satisfactory results. Though a 6 to 8-inch spark is quite sufficient for all purposes, experience has, I believe, universally shown that, for screen work especially, it is better to use a coil of higher capacity so as to maintain a regular discharge under all conditions. An App's 10-inch coil weighs about 60 lbs., but could be made in two separate parts of about 30 lbs. each. With regard to the difficulty experienced by the patients moving,—following a suggestion of Surgeon-Major Perry, A.M.S., I have found small half-filled sandbags suitably disposed about the part to be examined to ensure perfect freedom from involuntary movement. For long exposures it might be advisable to put the patient under chloroform. It would be interesting to hear what precautions are considered necessary to keep the stock of plates from the action of wandering X rays. Also the quantity of stores considered necessary for a campaign such as that on the Indian Frontier, and the most suitable size of plates or films, etc. In conclusion, I must congratulate the Medical Staff on the excellent results obtained. As an amateur, I find that there are so many points to be attended to in X ray working at home before satisfactory results are assured, that such successes as we have seen attained by this pioneer field equipment under overwhelming difficulties plainly show what great care and perseverance must have been exercised by the operators.

Mr. JOHN LE COUTEUR:—I have often wished to hear the results of the X ray in actual warfare, because it has been a matter of very great interest to me, and I have therefore followed the proceedings with very great interest. At the present moment I am experimenting with a view of making an apparatus—or having it made rather, because I do not make apparatus—so that a damage can be repaired on the actual field of battle. If a coil is damaged it is very often thrown quite out of gear, and rendered useless, whereas if you could repair the damage easily you might start an 8-inch coil, and come back with one perfectly useful, working at 6 inches. I have brought here to-day one or two sections to illustrate that point. This is a section of a coil. Supposing we made a coil in what we call the junk fashion, so that the engine junk can be taken out and a fresh one put in its place. Any lady or gentleman who is interested in the matter may see these specimens of the inside of the coil which are here for inspection. The great difficulty that we have found at the present moment has been that the coil has been so screwed up and embedded in wax and all that kind of thing that when damage was done it requires an experienced man and quite an elaborate tool shop to put it right. What I should like to see would be a coil which would be at once, within three or four minutes repaired and put into position for work. With regard to the latest developments in tubes, I must pay a little tribute to Dr. Mackenzie Davidson's tube. On Saturday last I was able to take a very fine photograph of a spine, under five minutes. The time before it had taken much longer than that, but apart from the actual photograph of the spine, the definition was beautiful, and certainly it is the finest tube that I have met with yet. Of course, a tube of this pattern would be rather difficult to carry in such a case as has been described by Surgeon-Major Beevor, but at the same time it is a tube which can be used whenever the X rays are used. Another matter which I do not think Dr. Beevor touched upon very well was that of taking a storage battery. That has been a point of extreme difficulty, and I should be glad if some person present could give us his opinion with regard to an idea which has been discussed between Dr. Beevor and myself about having a battery something in this fashion filled with gelatine, which can be easily charged up by a hand motor. I have been speaking to an experienced electrician about the matter, and he thinks it is quite possible that a hand motor could be taken on the field service to weigh about 50 lbs. A couple of men could

charge up the cells in from two to three hours, or for an emergency case they could get sufficient electricity to drive a 6-inch coil in about twenty minutes. If that is possible it does away with a great deal of the difficulty. These are the various forms of tubes for various classes of work. There is a tube here which is used for the inside of the face. This was made by my friend Mr. Cosser, and he also made me one for internal symptomatic photography, which is useful for special occasions and for rare cases. There is another difficulty. I am referring to difficulties, because I hope that by thought being directed to this matter we may arrive at something approaching perfection. The brake which I found most useful has been the Vril brake, but even that has its disadvantages and takes some time to adjust. The nearest approach to the brake which I have yet put in actual use is a modification of the Vril brake. The mercurial brake is altogether out of the question, and need not be even discussed. On the field you have not a dark room, and there has been a device made in Paris during the last few days for developing a plate in the daylight. A chemist in Paris has been consulting me as to the best means of getting over a little difficulty; that is, the action of the alkalies on the surface of what we call a developing box. I fancy we can get over that difficulty, and I hope in the course of the next few days to have a sample over of what we call the developing box, so that therefore the Roentgen photograph can be taken on the field and developed in the open air without the use of a dark room. As Surgeon-Major Beevor remarked, very often there is no time for taking an actual photograph, and you want to see by means of the fluorescent screen what is happening and where the bullet is, or the injury, and we have devised a screen for that purpose. There is a fluorescent screen here which has been made for me. It is one on a modified scale. I have not the screen in this, but it is merely a box which can be opened and the screen is put in here, and then the surgeon looks through the back of the bag, and he has an impervious dark room.[1]

Surgeon-Major-General T. F. O'Dwyer, M.D.—I did not come here to make a speech but simply to learn something, and I have learnt something to-day. There was one matter which the lecturer has referred to with regard to which I should like to ask for a little more detail, and that is, the system and the means of obtaining the electricity. He says he was not satisfied with the apparatus he had on the frontier, and he points to a hand dynamo which was the best means of obtaining the electricity. Then he says an accumulator can, if necessary, be charged at the field telegraph station. I have no doubt it can if you teach the people there how to do it; but my practical experience of the matter is this, that at present field telegraph stations are not competent to take charge of these apparatus; I think they damage them. I believe they require more instruction. That is a matter of detail which can be very easily got over. We should ask the assistance of the Royal Engineers in a matter of that kind. I should like to have the lecturer's experience as to how many Roentgen ray apparatus he thinks necessary. He says he does not desire every field hospital to have one, or needs one, but we must remember what a field hospital is intended for. It is attached to a brigade; and in a brigade there are four regiments, and that is a tolerably large unit. I think it would be better—of course it is presumption on my part to offer an opinion upon a matter in which I have no practical experience—if every field hospital had an apparatus of the kind. On active service the apparatus would be very often required, and one might replace the other. Therefore, speaking in a reasonable way, I do not consider we can have too many of them. It does not do to be hunting over the field of battle to get an apparatus to deal with the wounded men, and I suppose no one will dispute but that it is of

[1] Since the above the experiments have proved a success, and a hand-motor has been devised by the Photographic Association, so that the difficulties of taking accumulators, etc., has been overcome.—J. Le C.

very great importance that bullets and projectiles should be removed from the limb as soon as possible, and before inflammation is set up, and before dangerous symptoms are set up (although I am well aware that a movable field hospital would not always be the best place to use the Roentgen rays). That can only be done by having plenty of these apparatus by you and having trained instructors who can make use of them. In every base hospital I take it there would be one of those apparatus, and I believe they should be in all the field hospitals. I merely would like to have the lecturer's opinion upon that.

Dr. J. MACKENZIE DAVIDSON:—I am a non-combatant, and therefore I must approach the subject purely from a scientific aspect. In the first place, I should like to congratulate Surgeon-Major Beevor upon being a pioneer, especially under such very difficult circumstances. I think the work he has done confers great credit upon himself and also upon the apparatus provided for him. I think in addition to the ordinary X ray apparatus supplied, there should be supplied some apparatus to enable the precise localisation of the bullet to be carried out. I think it is very important to know the exact position. That can be obtained by very simple means, which I need not go into at present, but I simply draw attention to the point, because if the exact position of a fragment or fragments is known, they may be removed, of course, not only with much greater precision, but the searching about which is necessary with the present skiagraphs which are obtained, is avoided. A skiagraph produced by even the very best tubes, and with the best definition, is really a picture on the flat; it is a projection. It gives no idea as to the exact position or level of the bullet, and therefore some apparatus should accompany the coil and tubes to enable localisation to be carried out precisely. As to the means of best providing a current, that certainly is a very difficult question. Primary batteries are always very unsatisfactory. Accumulators of course have to be charged, and no doubt some form of dynamo worked either by hand-power to charge the accumulators, or even in the case of emergency to work the coil direct, would probably be the best. As to the tubes, I must say from my experience of tubes, Surgeon-Major Beevor showed great courage in only taking three with him, because I not uncommonly destroy three in a short time working with a strong current. Therefore, in the matter of tubes, there should always be a very considerable number supplied. Of course if the tube fails the rest of the apparatus is absolutely useless. Therefore I think a large number of tubes should always be supplied with any apparatus in the field.

Surgeon-Major W. C. BEEVOR, in reply, said:—These are the tubes which Mr. Le Couteur mentioned as being the best, the osmium-focus tubes. Dr. Mackenzie Davidson has given us his opinion in the matter, and I may say I am in entire accord with him. There is no tube to equal this pattern; there is no doubt about that. Dr. Mackenzie Davidson showed me yesterday when I had the great pleasure of first making his acquaintance, a method by which he tests these tubes. It is quite unnecessary for me to go into technicalities, but those who have worked some time with this X ray will very readily appreciate the value of these osmium-focus tubes. They really show you the bullet in its proper position and of its proper shape. With regard to the question of the storage battery, I am very glad that Surgeon-General O'Dwyer and Dr. Mackenzie Davidson and Mr. Le Couteur have drawn attention to it. If you will excuse me, I will just read my opinion on the matter:—"I will give you what appeared to be the difficulties specially involved in working the apparatus at the front. The generation of our primary current of electricity is at present a very serious consideration. The only means I had in Tirah was a heavy and cumbersome primary battery, worked by a mixture of bichromate of potash and sulphuric acid; the latter is too dangerous an article for military transport, unless accompanied by someone who will look specially after it. I ran out of the supply in Tirah, the railway company refused to forward more, and I had to gather together the few ounces carried in the equipment of the various field hospitals. I, therefore, condemn this form of battery for field work, and beg to

recommend the employment of a hand dynamo and portable accumulator. This combination has many advantages; in the first place, it will stand rough transport, and should one get out of order the other can be substituted. Thus, if the accumulator is run out or injured, the dynamo can be used to give sufficient current for most cases; with an amy in the field there is always plenty of hand labour for this purpose; and again, if the dynamo is out of order, the accumulator can be charged at the field telegraph station." Surgeon-General O'Dwyer has very kindly raised a question of much interest. He very truly remarks that at field telegraph stations you cannot expect—and if you do you will be disappointed—to find men who will charge your accumulator successfully and properly. But here again I maintain, as I have maintained all through, that the operator who undertakes the responsibilities of an X-ray apparatus should be independent of help. He should charge his own accumulators. You will find I am quite sure that the Royal Engineers and the Telegraph Department will help you in any way they possibly can—at all events that was my experience in Tirah, and I have greatly to thank them for their help and assistance. If it had not been for their help I should have lost many good cases. You will always find that the Roya! Engineers are very hard-worked in a campaign, and therefore you cannot expect them—either officers, non-commissioned officers, or men—to work what one may call overtime for the benefit of the X ray apparatus; much as they probably would be willing to do it, they have not the time. Therefore, I maintain we ought to take out one of these dry batteries. I have been trying several lately, and I have feared to bring them here, because we have not found a satisfactory one yet, though in a few days I think we shall succeed. I have tried three kinds in India, but none of them were successful. There was one successful kind of cell—some people might know it here—the dry electric cell, and that is the Obach. They use it a great deal in telephone companies, and so on. I got hold of some in India, and gathered them together, and I must say they worked admirably. Of course the difficulty in all these questions is great. It is very difficult to explain to a mixed audience of people who cannot be expected to understand about the force and strength and pace of an electric current, and therefore it will be unnecessary for me to go into details; but I must say that a primary battery will, I fear, always give us trouble at the front. I wish it was not so, but I am afraid it is. There is one thing I will say now whilst we are talking about trouble in the protection of tubes. I must say, with all due deference to other opinions, that if we had a small reostat attached to our apparatus it would be undoubtedly of great benefit. The man working the apparatus may have the fever, or he may get shot, or wounded, and if an unskilled hand begins to handle these tubes he is likely to do some damage. Even a skilled hand like that of Dr. Mackenzie Davidson's when he is playing with them breaks them, sometimes as many as three in a day; and if an unskilled hand takes them—unskilled in the regulation of the current that he drives through them—he will ruin the whole thing undoubtedly. But if you give him one of these reostats, you certainly do fit him up, I maintain, with a distinct advantage in the treatment of his tubes. With regard to the number of the apparatus which are necessary for the force, I quite agree, of course, with Surgeon-General O'Dwyer, that it would be a distinct advantage if we had one attached to each brigade, because, as he truly says, brigades and even units of brigades are sometimes separated many miles from one another, and may be attacked simultaneously; and so if you have one apparatus for a division, of course you must be able to travel from one brigade to another. Therefore it would be an advantage undoubtedly if we had one attached to every field hospital as a part of the equipment of a brigade. That is his opinion, and I should say it would be the opinion of everybody else who has studied the matter. With regard to the question of localising apparatus, which Dr. Mackenzie Davidson has very wisely brought up, there is no doubt if we could have a portable apparatus for the localisation of bullets it would be an

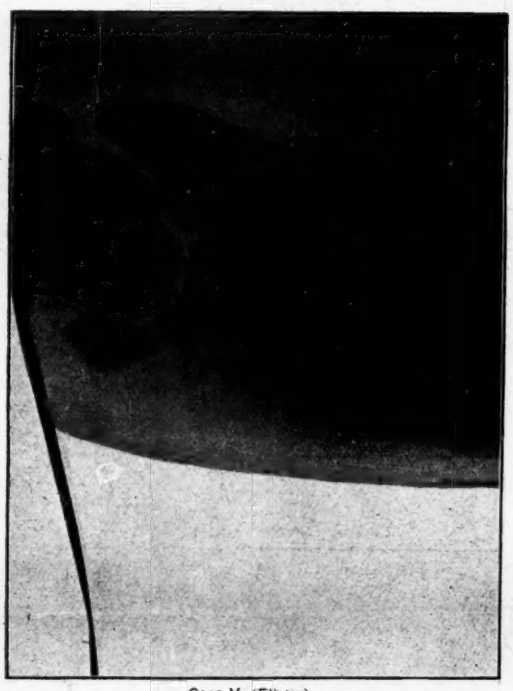
immense advantage There are various ways of localising bullets which one has thought out more or less at times, and often failed; but still the rotation of a limb for showing the distance of a bullet from the bone is a most helpful procedure. You can put it under the screen, but you cannot localise it with perfect accuracy. The best example I had was in the case of the foot which you saw where there was a small piece of lead a quarter-of-an-inch in diameter, and where the tissues over that portion of the foot are very dense and it is difficult to find foreign bodies in them. A very clever young surgeon—Surgeon-Lieutenant Flewry, A.M.S.—cut it out the next day. I give him all due honour for his skill, not only in that case but in others. He made a cross on the skin, and said:—"I think that is about where we shall get it," and he cut right down on the actual spot; that was luck, there is no doubt about it. I hope some day we shall be able, with Dr. Mackenzie Davidson's assistance, to design a localising apparatus which will put the question of our power of exact localisation beyond the chances of luck. I thank you very much for your attention.

The CHAIRMAN (Surgeon-Major-General J. Jameson):—Ladies and gentlemen, any remarks that I have to offer in concluding the debate must necessarily be practical, rather than mechanical or scientific. Every day we find more and more use for this kind of photography. For example, Dr. Stechow, a surgeon of the Prussian Army, lately found that a certain condition of the swelling of the foot occurring in soldiers after prolonged marches, and at field manœuvres, and which the French and Germans have described under the head of various names, such as footœdema, pied forcé, and such like, is really due to a fracture of the second metatarsal bone of the foot. This was quite unsuspected until it was demonstrated by the instrument. Of course this involves the question of treatment if we are to avoid the permanent injury following such an accident. I must say I have heard very little of that kind of accident in our own Army, although it is spoken of so frequently elsewhere, and I wonder if it is that perhaps our race have got larger or stronger feet than those of our neighbours—but that is another story. No doubt one of the most important things to be attained by this photography, is the possibility of forming an opinion of the nature of the fracture without removing the splints. This opens up another question as to supply and equipment, because it is manifest that our old iron splints, or even plaster of Paris apparatus, would be a very wrong thing to use under these circumstances interfering very much with the photography. Fortunately in the new equipment we have a different apparatus with open wire and wood, which will work admirably. Reference has been made to the necessity of supplying these various apparatus, very freely I thought, to the hospitals in the front, but the difficulties of transport must really be considered. It seems to me that from our present knowledge the advantages are not so very great after all in that part. The place, I think, for them is the line of communication, or at the base hospitals, because after all nothing except very urgent operations are advised to be performed in advanced places. What the photography really determines is more the position of a bullet, or the kind of fracture, but the urgency of an operation is determined by other considerations. There is one thing I was very much interested in, namely in the picture of General Wodehouse. I take a personal interest in it, having known that distinguished officer in Egypt, and also his father, Admiral Wodehouse, at Southsea. There is one circumstance that was not shown in the photograph, and it is this. While the operation was going on for the removal of the bullets, the Afridis crawled up, and suddenly blazed into the operating tent, and put thirteen shots through the canvas. That might have been a very disturbing element, interfering with aseptic surgery; but what happened? Nothing! The operation went on as if there was not an Afridi within 100 miles. In the Army we have taken very much interest in this subject of the X rays, and for 18 months we have had an apparatus at work at Netley, and the professor of surgery, Professor Stevenson, has done very good work indeed. I think he is more in

love with the apparatus which has been invented by Dr. Mackenzie Davidson than by any other. He speaks in the very highest terms of praise of the way in which by it any foreign body can be localised. We have also an X ray apparatus at Aldershot, and there the young surgeons undergo instruction in the art. I was very much pleased to see that five or six of them have become very good performers, and as a result of that three of them are at the present moment under orders for Egypt. We have also sent out two instruments to Egypt, one for use in the front and the other for the base at Cairo, and another is being perfected, and we have had the advantage of Surgeon-Major Beevor's experience in trying to introduce all the new improvements. We hope in a few weeks to have an apparatus at the Royal Hospital at Dublin, and another in the Herbert Hospital at Woolwich, and one at Gibraltar; and elsewhere as we can afford the funds. I think I may take this opportunity of expressing our gratitude to Surgeon-Major Beevor for the most excellent lecture he has given us—a lecture not only interesting but most eloquent. Personally I have received the very greatest pleasure in hearing it

Case II

Case III.



Case V. (Elbow)

Case VI.

Case VIII (Case IX. mislaid).

Case X.

Case XIII A

Case XIII. B.

The Photographs illustrating Cases I., XIV., and X

Case IV.

Case V. (Thigh).

Case VII. A.

Case VII. B.

Case XI.

Case XII.

Extra Case in place of No. I., shows extensive fracturing of leg bone and splitting up of a Snider Bullet.

Bullet and Poshteen covering from Case V.

nd XV., have unfortunately been mislaid.

NORTH-WEST FRONTIER WARFARE.

By Major A. C. YATE, 29th Bombay Infantry, or 2nd (D.C.O.) Baluch Bn.

SINCE the Battle of Waterloo the British Army has found itself opposed almost invariably, not to the disciplined forces of civilised Powers, but to the fighting men of barbarous or semi-barbarous tribes, and to the levies of nations and races not conversant with military training and exercises as practised in Europe. The exceptions to this rule are the Crimean War of 1854-5, the brief Egyptian campaign of 1882, and we may perhaps add the Sikh Wars of 1845-6 and 1848-9, the Persian Expedition of 1856-7, and the Indian Mutiny of 1857-9. The army of the Khalsa had been trained under Ranjit Singh, by Avitabile, van Cortlandt, and other European instructors, that of Persia by officers of several European nations, while thousands of the Indian mutineers had been disciplined, trained, armed, and equipped by our own Government and officers. We may enumerate Gurkhas, Afghans or Pathans, Baluchis, Bhutias, Bhurtpore Jhats, Nagas, Burmese, Shans, Chins, Kachins, Chinese, Malays, Kaffirs, Ashantis, Zulus, and many other tribes of East, West, and South Africa, Soudanese, Abyssinians, Maoris, and the Indians of our territories in Northern and Central America, as the chief of those races and tribes against which our arms have been turned for the defence or extension of our colonial possessions. Nevertheless, even to this day our military text-books afford no information, no instruction worth speaking of regarding the rules and methods in accordance with which warfare against uncivilised races should be conducted. The knowledge gained from time to time on this subject has remained locked up in the brains of those who have by practice won experience. Viscount Wolseley, Sir Redvers Buller, Sir Evelyn Wood, and Sir George White, hold, or have very recently held, the highest staff appointments at the Horse Guards. Lord Roberts commands the forces in Ireland, and Sir William Lockhart those in India. Sir Francis Grenfell and Sir Herbert Kitchener hold command in Egypt. These are our highest and best authorities on the art of savage warfare. These names figure in every campaign against uncivilised races from Burma in 1852 to Tirah in 1897. The experiences of these and of a thousand other British officers lie scattered here and there through an infinity of books telling of our minor wars all the world over, from New Zealand to Africa, and from China to that frontier that scarce ever knows peace, the frontier of India. Their knowledge has not been given to the military world in any systematic form.

NOTE.—This paper was commenced at Chaman, Baluchistan, in December, 1897, and completed in May last on the voyage from Yokohama to Vancouver.—A. C. Y.

Our last Burmese war, that of 1885-8, has as yet no historian, although it is understood that a detailed account of it has been compiled in the Intelligence Branch at Simla. By the industry of the late General Sir Charles Macgregor and Colonels Paget and Mason, that Intelligence Branch has also been furnished with a history of the Frontier Expeditions of India, completed to within a few years of the present time. These, however, are compilations intended for the use and guidance of Army Headquarters in India, and not for the general instruction of the British officer. There are hundreds of books treating in a more or less casual way of our Indian Frontier wars, and containing a wealth of useful hints and information, yet it is the year 1898 that has seen the appearance of the first effort to lay before the public a connected, if incomplete, treatise on our "Indian Frontier Warfare" of the last 20 years. Of the lessons that the fighting of the past year (1897) on the North-West Frontier has taught us there is not a word. The experience of our troops—some of our best British and Indian troops—in their recent fighting with the Mamunds and Afridis have been such, that no work on frontier warfare that omits to treat of these can be considered up-to-date. In short, Major G. F. Younghusband's work was practically behind its time when it made its appearance. If the first edition has been a success, the author can do no better than publish a second, and amplify the forecast which he in the first edition has summed up in one sentence (p. 33):—"As they [our frontier enemies] improve in armaments and improve in discipline, so proportionately will the problems alter which a British Commander will have to solve."

It is ominous, but not perhaps surprising in view of the little attention that our manuals of military instruction pay to savage warfare, to find one of the great educators of the officers of our Army, in the preface of a work on "Indian Frontier Warfare" laying down with perfect confidence the following law:—"If we are able to deal with civilised opponents we shall certainly have no difficulty in defeating savages, for it is by the training and discipline which render troops fit to meet those of their own state of civilisation that they prove superior to the savage when they meet him in the field." . . . . "The soldiers trained to meet the highest class of opponent are, *ipso facto*, better qualified to deal with the inferior." Even as the editor of the "Wolseley Series" was penning these words the Mamunds and Afridis were proving the fallacy of them.

Our earliest "Savage Warfare" was with the Indians and backwoodsmen of North America. In 1755, near Fort Duquesne, on the Alleghany, two Regular British regiments, some 1,300 strong, under General Braddock, were almost annihilated by 250 French Canadians and 650 American Indians. The Virginian Irregulars alone on that occasion held their own and saved a portion of the force.[1] Brigadier-General Forbes, who succeeded in 1758 where Braddock failed, and forced the French to evacuate Fort Duquesne, has left his opinion recorded in these words

[1] See the detailed account of this lamentable affair in F. Parkman's "Montcalm and Wolfe," Vol. I., chap. vii.

(writing to a friend):—"I have been long of your opinion of equipping numbers of our men like the savages, and I fancy Colonel Burd, of Virginia, has most of his best people equipped in that manner. *In this country we must learn the art of war from enemy Indians, or anybody else who has seen it carried on here.*"[1] So speaks the man of experience as against the man of theory. The Braddock School condemned such views as military heresies. There is a school, it seems, in 1898 that does likewise.[2]

The New Zealand, South African, and Soudanese campaigns all proved the need of special tactics and special training for our troops to enable them to meet Maoris, Zulus, Arabs, and Soudanese.

The author of "Indian Frontier Warfare" in his preface informs us that the editor had decided that the work should confine itself to expeditions and campaigns which had taken place during the last 20 years; the principal ground for this decision being that the invention of the breechloader and the extensive introduction of railways have materially altered the conditions under which Indian campaigns are undertaken and carried on. Railways do no more than enable us to bring our troops, supplies, and base nearer to the objective, without employing road transport. The invention of the breechloader and magazine rifle has furnished our Frontier foes with a weapon which they can use with only too fatal effect, as the past year has shown, against our troops. Nevertheless, it was the fine physique, the mobility, and the tactics of those foes that gave them their main advantage. The North-West Frontier warfare of the years 1838-78 affords most valuable lessons and precedents, fully as valuable as those of the years 1878 to 1896. It is by a study of all these that a just appreciation and judgment may be formed of all that has occurred from the first night attack at Malakand in July, 1897, to the crowning discomfiture at Shinkamar five months later. In the annals of 60 years' fighting with Afghan regulars and Pathan guerillas we find examples of every phase of warfare as practised against our troops during the past year—fighting both offensive and defensive, night attacks, attacks on piquets and convoys, ambuscades, and last, not least, rear-guard actions. We also read over and over again how infantry, artillery, and cavalry were employed to cover the retreat of our troops in the face of enemies as brave and relentless as any that our troops have encountered since July, 1897.

The first axiom of our warfare with Orientals has always been "Attack." It was established at the battle of Plassey, if not in the earlier fighting in the Madras Presidency, and it holds good still. If exceptions *do* prove the rule, they can be quoted, both positive and negative. Lord Gough's impetuous attack at Chilianwallah almost

[1] Parkman's "Montcalm and Wolfe," Vol. II., chap. xxii.

[2] An officer of Montcalm's army, at the defence of Quebec in 1759, the Chevalier Johnstone, states the merit of regular and irregular troops in that war thus succinctly:—"A Canadian in the woods is worth three disciplined soldiers, as a soldier in a plain is worth three Canadians." Parkman's "Montcalm and Wolfe," Vol. II., p. 218.

resulted in a defeat. It was a headstrong, frontal attack made on the spur of the moment, without any previous reconnaissance and with no formed plan or adequate disposition of the troops. It was begun, moreover, late in the day, when time could not possibly admit of a decisive action being fought and won. To quote another instance:—Between the 15th and 25th of January, 1842, every effort was being made at Peshawur to assist the retirement to India of the forces under General Elphinstone at Kabul and General Sale at Jalalabad. The annihilation of General Elphinstone's force was not known for certain in India till the end of January. Brigadier C. F. Wild was in command of some 4,000 Native troops (no British at all) at Peshawur, and he apparently did his very best to carry out the urgent orders that he had received to support Elphinstone and Sale. He was promised by General Avitabile the co-operation of four Sikh battalions and some Sikh artillery. By the 15th of January the Afridi tribesmen had determined and announced their determination to oppose the advance of any British force towards Ali Musjid, the relief and reinforcement of which post had become a matter of extreme urgency. No reliance was to be placed on Avitabile and his Sikhs. That same night (15th of January) two Hindustani regiments (53rd and 64th), under Lieut.-Colonel J. Moseley, pushed through to Ali Musjid almost unopposed. The Afridis were unprepared for them. Unfortunately Colonel Moseley's column had but a few days' supplies with it. The Afridis were now on the *qui vive*, and when on the 19th of January Brigadier Wild, with the 30th and 60th Native Infantry and four Sikh guns (both gunners and guns proved worthless), tried to force his way with a convoy of supplies to Ali Musjid, he was beaten back with heavy loss. The Sikhs failed him entirely, and his Hindustanis lost their heads. He reported them afterwards as "inexperienced in hill warfare, and having seen no service for twenty years." One officer was killed, the brigadier and six others wounded, and the loss of killed and wounded among the Native ranks was very heavy. The brigadier, in a Brigade Order published on the 21st January, comments in very plain language on "the hesitation evinced at the head of the column to obey the urgent call to advance addressed to it by the brigadier and his staff (as they took the lead), and on the crowding together and standing still, firing without orders in every direction, and generally without aim." This is an unvarnished picture of demoralisation.[1] A small party (perhaps 50 to 100 sabres) of the 3rd Irregular Cavalry was with Brigadier Wild's force, and by charging the Afridis as they descended from the hills into the open in pursuit of the retiring column, rendered effectual aid in covering the retreat towards Jamrud. After this repulse Lieut.-Colonel Moseley found it impossible to maintain his position without supplies at Ali Musjid, and on the 24th of January he fought his way through the Afridis with the 53rd and 64th Regiments N.I. to Jamrud. Lieut.-Colonel Tulloch, with the 30th and 60th N.I., the 4th

[1] The order, a temperate and judicious one, is quoted *in extenso* in Stocqueler's "Memorials of Afghanistan," Calcutta, 1843, p. 181. *Vide* also Afghanistan Blue-Book of 1843, letters Nos. 161 and 163.

Company 60th Battalion Artillery, and a small detachment of the 3rd Irregular Cavalry, advanced from Jamrud into the Pass to aid the retirement. Both the regiments under Colonel Moseley, and especially the 64th to which was assigned the difficult task of covering the retreat, behaved steadily and gallantly.[1] Not a wounded man appears to have been left behind. The 30th and 60th N.I., under Colonel Tulloch, did something to retrieve the reputation which they had forfeited on the 19th. After Colonel Moseley's column had retired through the covering position taken up by Colonel Tulloch, the brunt of the fighting fell upon the covering party of the 60th N.I. That corps lost during the day three British officers and fifty-seven of the Native ranks killed and wounded. The 53rd and 64th lost three or four officers, and about 180 of the Native ranks killed and wounded, probably one-sixth or one-seventh of Colonel Moseley's force. What Brigadier Wild succeeded in doing he did with four regiments (say 3,000 rifles), composed exclusively of the now little-esteemed Hindustani sepoy, of which in those days the Native Army of Bengal was mainly composed. He had no British troops.

It is hard to understand how and why in the recent operations in Tirah thoroughly reliable British and native troops were unable not only to repulse, but to protect themselves from the pursuing Afridis. The reason of it has not been made apparent. Admittedly the massacre of the entire Kabul force in January, 1842, and the disastrous defeat of Maiwand, in 1880, entailed graver losses and results; but the causes of defeat were evident. In the first case a demoralised force of 4,000 to 5,000 men under an invalid general, encumbered by some 12,000 followers, including women and children, was simply at the mercy of foe and weather in the passes between Kabul and Jalalabad. In the second case the victory, which dash and good leading might have won for the small force under General Burrows over the 20,000 men and 30 guns commanded by Ayub Khan and his lieutenant, the Loi Naib, was thrown away by a half-hearted passivity which, as history can show, has almost invariably resulted in failure. Maiwand was in its own way a repetition of the disastrous action fought by Brigadier Shelton at Bimaru on the 23rd of November, 1841. In both cases the cavalry were kept inactive under the enemy's fire for hours, so that when they were wanted they were unable to act.[2] In these two actions our troops had to contend with greatly superior numbers and a variety of adverse circumstances. Shelton's troops were certainly demoralised; and though history has not been very explicit about the affair at Maiwand, there is sufficient evidence that the morale of General Burrows' force was not what it should have been. In the case of the recent fighting with the Afridis and Momands no such thing can be said of the troops engaged. They are as good troops as any that the British

[1] To quote Colonel Moseley's own despatch:—"Our return was accomplished n the face of a wary and active foe, whose numbers, always considerable, were invariably found to be the greatest above the narrower and more difficult defiles."

[2] See Vincent Eyre's "Operations at Kabul," chap. vi.; Kaye's "Afghan War," Vol. II., pp. 245-50; and Hensman's "Afghan War," Part II., chap. v.

or Indian Army can produce, and they were splendidly led by their officers. Yet they have been severely handled by men who are not disciplined, who have not greatly, if at all, outnumbered them, and who are not better, if as well, armed. There must be a cause for this, and that cause is to seek. There are but two places to look for it. The one is on the scenes of battle themselves, and the other—the one we propose to examine—is the history of our 60 years' warfare with the Afghans, under which name we include every tribe that speaks Pashtu, be it independent, subject to our Indian Government, or owning allegiance to the Amir.

Where our troops have, as a rule, achieved the most decisive success against Afghans and the tribesmen of Yaghistan[1] has been when acting on the offensive. In such actions they have repeatedly won the day, when the enemy occupied strong defensive positions and outnumbered their assailants by from 2 to 10 to 1, or even at greater odds. We are most of us rendered familiar by Lord Roberts's "Forty-One Years in India" with the details of the actions of the Peiwar Kotal (odds uncertain —perhaps 2 or 3 to 1), of Charasia[2] (odds about 4 to 1), and of Kandahar (odds 2 to 1 or less). The two first were stiff engagements, the last was a facile victory. Ahmed Khel may also be classed in its inception as an offensive action (seeing that Sir Donald Stewart advanced to attack the enemy), although during the critical time of the engagement our troops found themselves constrained to act on the defensive. It is well known that the sudden charge of from 3,000 to 4,000 armed villagers produced a momentary unsteadiness among some of the troops engaged. If that charge of Afghan swordsmen was ordered by the leaders, they showed sound judgment in assuming the offensive and not awaiting our attack. It is probable, however, that the order that directed that charge was the innate fanaticism of the thousands who made it. They did not greatly exceed in number the force which they charged. Had the other 10,000 who stood on the hills (as Mr. Hensman tells us) backed up the charge of the armed villagers, or as some call them, "ghazis," it is possible that the force under Sir Donald Stewart would have been roughly handled. The half-heartedness of that 10,000 left the victory with our troops. The nominal odds in the action were about 5 to 1 in favour of the Afghans, but two-thirds of the Afghans would appear never to have come to close quarters. At Maiwand the odds were, it is said, 10 to 1 or more before the climax of the engagement was reached. Ayub Khan's reinforcements kept coming up all through the fight. Had General Burrows gone in straight at the head of Ayub Khan's column of route which he caught on the march across his front, it is generally considered that he would have defeated it with ease, and that Ayub's great gathering would have broken up. As it was General Burrows disposed his troops in a most indefensible

[1] The name which Pathans give to the country of the independent tribes between the territories of the Government of India and of the Amir. The Afridis, Orakzais, Momands, Swatis, Bunerwals, are the principal tribes still "Yaghi," or independent.

[2] See also Younghusband's "Indian Frontier Warfare," p. 26.

position, and when his men could stand the pounding and pressure and heat no longer, they gave way, fell into confusion, and were driven off the field. This action[1] and that of Bimaru, in 1841, are the most striking instances that our warfare with the Afghans affords of the inadvisability of acting on the defensive. At the same time the defensive has been adopted successfully on several occasions. The defence of Sherpur, on 23rd of December, 1879, is not to the point. The Afghans had not the ghost of a chance against our troops behind entrenchments. We can only draw fair conclusions from the defensive in the open. On the 16th of May, 1840, near Kalat-i-Ghilzai, Captain Anderson, with a regiment of foot, four guns, and a few cavalry,[2] "found the enemy, about 2,000 strong, occupying some hills in his front. Twice the enemy charged. The guns repulsed the first, the infantry the second charge at the point of the bayonet. The victory was complete."[3] In May, 1841, at Assiai Ilmee, near Kalat-i-Ghilzai, Colonel Wymer, with 400 men of the 38th N. I., four horse artillery guns, and a party of Christie's Horse (Shah Shuja's troops), held in check from 5.30 to 10 p.m. a body of Ghilzais, estimated at 2,500 at the commencement of the action, and believed afterwards to have been swelled to 5,000 by reinforcements. Colonel Wymer had a convoy to defend, and so was "compelled" to adhere to the defensive.[4] Stocqueler thus describes this action—"The Ghilzais moved on, and coming upon Colonel Wymer's force in the night" (N.B.—The action appears to have commenced before nightfall), "and in camp, they, fully 3,000 in number, immediately attacked our troops who had formed in front, rushing down to the bayonets. They were repulsed, but again and again made the attempt in very gallant style; this failing, they tried the flank and turned it, but got well drubbed for their pains. They exhibited a most determined spirit, only exceeded by the truly loyal and gallant behaviour of the sepoys, who, solicited by the Ghilzais to give up their charge, replied by discharges of musketry. Their bravery repulsed every attack, and at length drove the enemy off the field. Next morning, 70 of the enemy were found to have fallen." Colonel Wymer himself reports that he lost only 4 killed and 15 wounded, and that 64 Ghilzais were found dead in the morning close to his camp, those who fell further away having been removed in the night. The appeals made by the Ghilzais to the sepoys to surrender, remind us of the similar appeals made by Pathan to Pathan during the night attacks at Malakand, and similarly replied to by "discharges of musketry." On the 14th of October, 1879, at the commencement of the second phase of the second Afghan War, 150 rifles of the 21st P. I., 100 of the 3rd Sikhs, and two mountain guns repulsed and drove off from 3,000 to 4,000 Ghilzais. For four or five days after this attack, Colonel Money, with two native regiments and four mountain guns, held his own at the Shuturgardan, against a force of Afghans

[1] See Younghusband's "Indian Frontier Warfare," p. 108.

[2] Apparently all native troops and some, if not all of them, belonging to Shah Shuja's contingent.

[3] Kaye, Vol. II., p. 58.

[4] Kaye, Vol. II., p. 121. "Memorials of Afghanistan," p. 150.

estimated at from 10,000 to 17,000 (Hensman, chap. viii.). On or about the 20th of April, 1880, Colonel Jenkins, with two guns R.H.A., 266 of the 92nd Highlanders, and the Corps of Guides (216 sowars and 614 sepoys), defended a position from day-break till noon against 5,000 Pathans. This was a strictly defensive action. The cavalry had to sit patiently for hours under fire, but did not lose their morale. When reinforcements arrived and drove off the Afghans the cavalry did their duty in the pursuit.

We have already mentioned one instance, the retirement of Brigadier Wild's small force on the 19th of January, 1842, when a handful of cavalry did good work in checking the tribesmen's pursuit. The value of cavalry for this purpose, and its great moral and material effect at all times on the Pathans, has been proved over and over again. On the 12th of November, 1841, Colonel Dennie, in an action near Jalalabad, launched his cavalry on Muhammad Akbar Khan's Afghans. "They drove the enemy[1] four miles up a defile, cutting down great numbers and scattering them in all directions, many throwing away their arms and escaping up the hills." In March, 1860, Risaldar Sa'adat-Khan, 5th Punjab Cavalry, with 160 sabres of that regiment, drew (by feigning retreat) 4,000 Waziris into the plain near Tank, and then charged and routed them, killing some 200 and wounding many more. The loss on our side was one man killed and fifteen wounded, and several horses. "An old Punjaubi"[2] thus graphically describes the scene:—"In March, 1860, incited thereto, perhaps, by long years of forbearance on our part, the Mahsud Waziris made a hostile demonstration on the town of Tank, some four or five miles from the frontier line, and came on about 4,000 strong with the intention of sacking the town. To meet them there were only about 160 sabres of the 5th Punjab Cavalry and some police troopers under the command of a native officer of the 5th, named Sehâdut Khan, a resolute soldier and, as he proved himself, a good tactician. Drawing out his small body of cavalry, he advanced to meet the Mahsud invaders, but suddenly terrified, as it appeared to them, by their imposing array, he commenced a retrograde movement. The Mahsuds followed helter-skelter, firing their matchlocks and showering abuse on the fugitives' heads; when having obtained his object in drawing the Mahsuds clear of the hill ravines and into the open, where cavalry could act, he wheeled his small troop about and charged down on the disorganised body of the enemy. A complete rout was the result; numbers were slain and wounded, and the whole rabble made off to the hills as fast as their mountain legs could carry them. Their loss was 200 killed and a large number wounded. On our side there were one trooper killed and fifteen wounded, and several horses killed and wounded." In the second Afghan War cavalry were on several occasions used with excellent effect against bodies of Afghans, horse and foot, broken and

[1] Rev. J. R. Gleig's "Sale's Brigade," pp. 114-15.
Afghan Blue-Book. 1843. Letters Nos. 15 and 16.

[2] "The Punjab and the N.W. Frontier" (1878) p. 72.

unbroken;[1] and at Khar, in the Chitral Expedition of 1895, Captain (now Lieutenant-Colonel and V.C.) Adam and Lieutenant Baldwin, with 50 sowars of the Guides, charged suddenly, routed, and pursued, inflicting on them heavy loss, a force of 2,000 Pathans, who were advancing from behind a spur, to make an enveloping attack on our infantry, which was already heavily engaged with superior numbers of the enemy. Recently[2] the Guides and the 11th and 13th Bengal Lancers have on several occasions charged (on rough ground), scattered, and inflicted severe loss on large bodies of Pathan footmen. In January, 1864, a squadron of the 7th Hussars made (on much the same ground near Shabkadr as the 13th Bengal Lancers charged over in August, 1897) three successive charges on a body of 5,000 Momands, and by breaking their line paved the way for the success of the infantry attack. Sir Sydney Cotton,[3] whose work on the frontier dated from 1853-63, started with the idea that cavalry would be no use in such a mountainous country; but he soon found use for them, and later on mentions once or twice having utilised them to support and cover the retreat of his infantry.

Just as Lord Roberts, Sir Neville Chamberlain, and Sir William Lockhart are the foremost of our living authorities on North-West Frontier warfare, so may Sir Sydney Cotton take a high place as an authority on the same subject 40 to 50 years ago. His "Nine Years on the North-West Frontier" is a book worthy of study. In 1853 we find him in command of six companies of a regiment of British infantry taking part in an expedition to punish and coerce the Kohat Pass Afridis. He was new to the work, he candidly admits—as new as[4] "The officer of the British Service, a perfect stranger to hill warfare," who came into camp a night or two before the attack was made and assumed command. The force consisted of "six companies European Infantry, the Guide Corps horse and foot, a regiment of Goorkha Infantry, a regiment of Hindustani Infantry, a nine-pounder field-battery, the mountain train with four three-pounders and four twelve-pounder howitzers, a regiment of Native Irregular Cavalry, with some few other detachments." On the advance of this force into the Bori Valley, the Afridis took to the hills and commenced "sniping" at the troops who approached their villages. The Guides Infantry were ordered to skirmish and "to take their hills from them, a work not only of difficulty but with European soldiers nearly impracticable." When Sir Sydney Cotton contends that the British soldier is not a match for the Pathan on a hillside, what he says is true enough in so far as that the Pathan is in agility and endurance among his native hills unequalled, and lightly clad and equipped as he is possesses an immense initial advantage over the average soldier saddled with

[1] Younghusband, "Indian Frontier Warfare," chap. viii.

[2] See "Risings on the N.W. Frontier," pp. 45, 51, 58-9, and Part III., chaps. iv. and vii.

[3] "Nine Years on the N.W. Frontier of India," p. 85, etc.

[4] When Sir Sydney Cotton's own words are quoted, they are put in inverted commas.

accoutrements and untrained to hill work. But the British soldier has beaten the Pathan on his own hills over and over again: witness Charasia in 1879 and Dargai in 1897. The Rev. J. R. Gleig in his "Sale's Brigade in Afghanistan" passes the highest eulogium on the 13th Light Infantry as hill-fighters. In fact, instance on instance can be quoted of actions in which the British soldier has swept the Afghan off his hillsides and ousted him from most difficult positions. In the days, however, of Sir Sydney Cotton the correct thing was to husband the British soldier for the critical moment and not to expose him to undue loss. Nay, more! British troops were but sparingly employed at any time on these border expeditions. They were held to be too valuable in the years just preceding the Mutiny when we had weakly allowed our army of occupation in India to dwindle down to from 30,000 to 40,000 men. So much so that when in 1863 four British regiments were sent to take part in the Ambéla affair, an old frontier official[1] remarks that they were "an unusual element in these expeditions." In 1853, at any rate, we find the Guides and the Gurkhas told off to clear the hills. The Gurkhas had established their reputation for hill-fighting against Pathans at any rate as early as 1842, when Mr. Gleig[2] thus writes of those who had been enlisted for the service of our ill-starred nominee, Shah Shuja'-ud-daulah: "Small men, but resolute and active, they ran from rock to rock with surprising celerity, and delivered their fire with a degree of accuracy and correctness of aim which won for them the applause of their European comrades. The officers and men of the 13th, though excellent skirmishers themselves, beheld the working of these wild mountaineers with delight." Since those days the Gurkhas have won many a laurel; and from them were selected Sir William Lockhart's "scouts," several hundred strong, in the Tirah Expedition, brought to a close in March last. Had hostilities been recommenced, it was Sir William Lockhart's intention to employ from 500 to 600 of these selected Gurkha "scouts," under selected officers of the Gurkha battalions.[3] It would appear that even as early as 1853 the reputation of the Hindustani sepoy was on the wane. It is possible that the Sikh wars dealt it a severe blow. In some of the hard-fought engagements of the two Sikh wars there were occasions in which the Bengal Infantry regiments did not distinguish themselves. The Mutiny gave the death-blow to the "Pandy's" reputation. In the Kohat Pass Expedition of 1853 Sir Sydney Cotton practically ignores the Hindustani regiment that formed part of the force employed. He barely mentions it. To revert to what took place on that occasion—Sir Sydney Cotton records that the destruction of villages and property was but

[1] "The Punjaub and the N.W. Frontier by an old Punjaubi," p. 72.

[2] "Sale's Brigade," p. 105.

[3] In the first Afghan War and early expeditions against the N.W. Frontier tribes, the Light Companies of regiments did the work that has recently been entrusted to Gurkha "scouts." Captain White of H.M.'s 40th Regiment with the Light Companies of General Nott's Division did excellent service in 1842. Several writers make special mention of it. See Nott's despatch of 8th September, 1842, quoted in Stocqueler, p. 262.

imperfectly done, and "at all times, as the force passed on, the Afridis re-occupied their towers with incredible celerity." Finally came the critical moment of retirement. "The 'recall' of the skirmishers was sounded. The two companies of skirmishers had scarcely got into column when a fire of matchlocks through loopholes of the village walls was opened upon them. . . . . The fact was that the hillmen had been watching the skirmishers, and, when they were recalled from the mountain-top, came down like deer into the village, under cover of the smoke, and re-occupied it in very considerable force. . . . . The troops were speedily moved nearer the wall, and their bayonets being fixed, about 200 men rushed into the village, but the mountaineers had fled back as speedily as they had come, and not one was disposed of." Sir Sydney Cotton remarks that his small loss from this fire was due to the shots mainly passing over the men's heads, the loopholes in the walls being so constructed that the muzzles of the matchlocks could not be sufficiently depressed. General Nott and several others[1] have recorded that the Afghans habitually fired too high. It is a common fault with troops of all nations. As regards artillery for this mountain warfare Sir S. Cotton evidently favoured the mortar and howitzer. On this first expedition of his he remarks:—"The artillery were of little use, though in subsequent affairs of this nature I discovered the value of 5½-inch mortars." A year or so later he led a force against the Momands, and covered his retreat (the Momands followed him up as the Mamunds did Brigadier-General Jeffreys) with his guns and European light infantry. "When everything had been accomplished that was either required or intended, the most difficult part of the operations (the retreat) had to come off, and never in the author's recollection was a retreat more difficult. The mountain battery covered the retreating force by firing and retiring half-batteries, with European Light Infantry extended; and by shells from the 24-pounder howitzers, kept back the mountaineers from pressing down the hill on the rear of our troops as they were drawn off." Again, on 3rd May, 1858, he covered his withdrawal with detachments of the 98th Regiment and the Guides,[2] employing "with very great advantage two 5½-inch mortars" to support the covering infantry. Sir Sydney Cotton's most telling remarks are however those in which he criticises his own mistakes in his first expedition. His criticisms on himself are as outspoken as on others, thus:— "The author freely admits the error he made in withdrawing his Light Infantry until he had moved off his column into a place of security; and his only reason for it is, that neither he, nor anyone else, could imagine that there was any living soul within reach; tending to prove that experience in this, as in all other matters in hill warfare, is the one thing needful. This was the author's first adventure in the hills, and before it came to a conclusion he had learned lessons and received 'solemn warnings' which in after times were of the utmost

[1] *Vide* Stocqueler, pp. 130, 134, 192.

[2] He was withdrawing after an attack on Sitana, then, as now, the stronghold of the Hindustani fanatics.

value to him. The principal harvest of these mountaineers is looked for on the retreat of their enemy from their mountain fortresses. It must be manifest that the hills, by which an enemy's force ascends, must be, sooner or later, descended, and as the agility of the mountaineers never fails, no sooner are their mountain tops evacuated by their enemy than they re-occupy them, pouring down a deadly fire on their retreating enemy, who are then not in a position to retaliate. *The most dangerous and most difficult of these flying operations is therefore towards the conclusion of the work.*" I met recently a retired officer who had seen much service on the Frontier from 1845-56, and afterwards in the Mutiny, and who had served under Sir S. Cotton. He gave me an account of a raid into Afridi territory (from Fort Bard to Matanni) made by a force composed of native troops in or about 1854. Their aim was to "lift" Afridi cattle, and that they did successfully. In retiring they were followed up by the Afridis, and although the retreat was skilfully conducted, they lost 53 killed and wounded. A cattle-lifting expedition also led to the Shinkamar affair.[1]

The march of Sale's Brigade from Kabul to Jalalabad, in October, 1841, has been treated of by some of the ablest writers on the First Afghan War, notably, Kaye, Vincent Eyre, Rev. J. R. Gleig, and Major George Broadfoot.[2] To compare its incidents with those of the recent frontier fighting is extremely interesting. A large body of Ghilzais had assembled at Khurd-Kabul and cut off communication between Kabul and India. On the 11th of October, 1841, General Sale marched with a force of all arms [3] from Kabul and camped not far from Butkhak. His camp that night was persistently "sniped," the loss being 35 killed and wounded. On 12th October the pass between Butkhak and Khurd-Kabul was attacked and successfully forced, with a loss of five officers wounded (including General Sale) and six men killed and thirty wounded. The 13th L.I. was ordered to march back to Butkhak that same afternoon, and was repeatedly fired on and suffered some loss on the way. General Sale's force remained encamped, part at Butkhak and part at Khurd-Kabul, for some days, and was "sniped" at every night. One officer and many sepoys of the 35th N.I. were, among other losses, killed. By the 22nd of October, Sale received some reinforcements and advanced to

[1] An officer has only two means of acquiring experience in frontier warfare, viz., by personal active service, and by study. As has been pointed out above, no manual of instruction in this class of warfare exists. The libraries of the Royal and Indian United Service Institutions are not within the reach of one officer in a hundred. The officer who desires to study Indian Frontier Warfare must make his own library at great trouble and expense (for the books are now mostly scarce and costly), and that not one officer in a thousand can or cares to do. It is for the War Office to produce a good manual on "Savage Warfare," and bracket it with the other indispensable text-books with which every officer ought to be conversant.

[2] Sale's own dispatches are quoted by Stocqueler, pp. 164-72.

[3] 13th L.I., 35th N.I., No. 6 Light Field Battery, the Mountain Train, the Corps of Sappers and Miners, Squadron 5th Light Cavalry, and a Risála of the Shah's 2nd Cavalry.

Tezin, encountering much determined opposition on the road. On the 26th, Sale detached the 37th N.I., under Major Griffiths, with three companies Sappers and three guns to Kabr-i-Jabar, and himself with the remainder marched for Jagdalak *viâ* Kata Sang. Major Griffiths ultimately fought his way back to Kabul on the 2nd and 3rd of November.[1] To quote V. Eyre:—"While striking his camp he (Major Griffiths) was attacked by the mountaineers, who now began to assemble on the neighbouring heights in great numbers; and his march through the pass from Butkhak to Kabul was one continued conflict, nothing saving him from heavy loss but the steadiness and gallantry of his troops, and the excellence of his own dispositions." Meanwhile, on the 26th and 27th October, Sale's rear guard was "pretty constantly engaged." On the 28th he reached Jagdalak, escaping an ambush by a judicious change of route. On the 29th, however, during the march from Jagdalak to Surkhab, his rear guard was very severely handled. Major G. Broadfoot thus describes what happened:—"The first three miles of the road are up a steep incline, difficult for guns and laden camels, commanded by the heights on either side till the top is reached; after that the pass becomes more open, with a descent to Surkhab. The plan adopted for protecting the march through was that the advance and main body should detach parties right and left to ascend to suitable posts, hold them till the baggage passed, and then come on with it. An excellent arrangement, provided the main body halted at the top of the pass to give the baggage and these protecting parties time to join. Unfortunately this was not done; the main body moved off, leaving the posts referred to and the rear guard to withstand the pressure of the whole strength of the enemy now concentrating at the exit of the pass. The parties sent to protect the baggage seeing themselves abandoned by the main body, with one honourable exception, quitted their posts, and the whole force of the enemy came down on the rear guard, which fell into the greatest confusion and panic. The panic-stricken companies of the 13th (L.I.) and the 35th (N.I.) hurried forward in confusion to get out of the pass. The Ghilzais occupying the cover on either side fired into the mass of fugitives, and the villagers pressed up the pass after them knife in hand. Most fortunately a few intrepid British were found to face the enemy and hold them in check till they reached the exit of the pass. During this scene of terror all who fell wounded were of course abandoned. Ultimately reinforcements were sent back from the main body and the rear guard arrived at Surkhab just about dark." No writer has given a more graphic description of the guerilla tactics with which the Pathans opposed and harassed Sale's march from Kabul to Jalalabad, and of the precautions taken and dispositions made, first by General Sale, and, after he was wounded, by Colonel Dennie, to protect the camp at night and guard the line of march by day than the Rev. J. R. Gleig. His account of the fighting in the Jagdalak Pass on the 28th October, is more clear and graphic even than that of Major

[1] For a full description of Sale's operations see V. Eyre's "Operations at Kabul," pp. 8-15; "Career of Major G. Broadfoot," pp. 30-38; and Gleig's "Sale's Brigade in Afghanistan," pp. 105-16.

Broadfoot It should be read for itself. Space does not admit of quoting it here. His summary of the Pathan tactics is as true now as it was then, as Tirah bears witness. "Now it was in operations such as this, that from the beginning to the end of the war, the Afghans proved themselves to be especially skilful. Though individually brave, they seldom stood to oppose our men, either in a stand-up fight upon the plain, or in a smart skirmish; but wherever they found an opening whereby to approach our baggage and rear guards at a disadvantage, no troops in the world knew better how to turn it to account. They slew this day (28th October) a good many men,[1] and carried off no inconsiderable portion of booty . . . . (including) certain kegs containing not fewer than 30,000 rounds of musket ammunition." We supplied them with ammunition, it seems, then as now.

The march of Sir W. Lockhart from Bagh to Bara, has already come to be spoken of as "historical." There is another march, that of Generals Pollock and Nott, from Kabul to Peshawur, in October, 1842, that is equally "historical," though it has passed out of ordinary memory.[2] The forces under Pollock and under Nott marched separately from Butkhak to Landi Kotal. During this part of the retreat, General Nott's division fought a rear-guard action, of which the Rev. T. N. Allen has left the following account.[3] "Night closed, and we became very anxious on account of the rear guard, which consisted, I believe, of a part of the 42nd B.N.I., two other companies of sepoys, which had been detached on the line of march, and two of Captain Leslie's guns, under the command of Lieutenant Brett, the whole commanded by Captain Leeson, of the 43rd B.N.I. Just as we had finished dinner at H.M. 40th Mess, the regiment was ordered under arms. . . . Major Hibbert went out with a wing of the 40th Regiment, and two companies of H.M. 41st, under Captain Blackburn, followed in charge of dhoolies and ammunition. They found Captain Leeson's rear guard under heavy fire and hard-pressed. The grenadier company of H.M. 40th Regiment, under Lieutenant Wakefield, with a loud cheer, ascended the hill in front, from whence the enemy were making the attack, and cleared it. Major Hibbert, with another company under Lieutenant E. White, then advanced and cleared two other hills, and recovered the body of a European artilleryman, which had been stripped by the enemy; this and the other bodies, including those from General McCaskill's Brigade, which we had seen in the morning, were then placed on camels, the wounded in dhoolies, and the party retired, the reinforcement forming the rear guard. The loss was 10 killed and 42 wounded. Great praise was deservedly given to the

[1] Gleig reports 29 killed and 91 wounded. Sale's own report of the casualties on the 28th and 29th October gives 130 killed and wounded, including 1 officer killed and 4 wounded.

[2] *Vide* "History of the War in Afghanistan, from the writings of an officer of high rank," edited by C. Nash, pp. 405-7.

[3] Diary, p. 332.

officers present in this affair."[1] During this part of the retreat from Butkhak to Jalalabad, the columns were attacked almost daily, the Afghans frequently charging with the sword. Every fort and village was destroyed *en route*, and not a particle of baggage fell into the enemy's hands. When Pollock and Nott approached the Khyber, the Afridi Maliks came to enquire (from Captain Mackeson, a *beau-idéal* of the frontier political agent, assassinated at Peshawur some years later) what the General was disposed to pay for a free passage. We had paid so often for free passages for our troops through frontier passes, that the reply of General Pollock that he meant to force a passage was a surprise—doubtless a painful surprise—to them. The passage was successfully forced in three columns, the first under Pollock himself, the second under McCaskill, the third under Nott, each marching a day behind the other. Pollock, in the march from Landi Kotal to Jamrud, lost a few men, and a considerable quantity of baggage. McCaskill lost 2 officers and about 60 sepoys killed and wounded.[2] Nott's column (the rear-most, and therefore the most hardly pressed), thanks to the General's excellent arrangements, lost not a single camel, and only two officers wounded. The total loss in killed and wounded in this retreat from Kabul to Peshawur, according to official despatches quoted by Stocqueler,[3] was 3 British officers killed and 10 wounded, 3 British soldiers killed and 14 wounded, and 23 native soldiers killed and 82 wounded. These columns had to fight not only the Afridis, but every marauding tribe between Kabul and Jamrud.[4] What, however, Pollock and Nott had done, with from 12,000 to 15,000 men, Lieut.-Colonel J. W. Moseley had done (as already narrated) on the 24th January, 1842, with from 1,200 to 1,500 bayonets, and no guns. These troops were armed with muskets, a fire-arm inferior to the jezail; yet two regiments of Hindustanis did what in 1897-8, we employed two brigades to do. The old belief in our power to cope with these mountaineers at odds of 1 to 5 or more is dying out or dead. In 1878, we find "An old Punjaubi" admitting that 10,000 (not 5,000) men were needed at Ambéla.[5] The same author, at p. 138, writes thus:—"As regards the opposition we should be likely to meet with (in an advance on Kabul) and which is somewhat insisted on by Lord Lawrence, let the reader look back at the advance of

[1] See the official report in Afghan Blue-Book of 1843, pp. 423-4. The loss on this occasion was 3 officers wounded, 12 men killed, and 46 men wounded. Night overtook this rear guard before it reached camp, hence the loss.

[2] Again owing to the rear guard being overtaken by night and the Afridis, before getting into camp. See Afghan Blue-Book of 1843, p. 427.

[3] Pages 288-96.

[4] General Pollock, in a letter to the Governor-General, dated Jalalabad, 23rd October, 1842, states it to be his opinion (in spite of the reports of Generals Nott and McCaskill) that the troops had been attacked only by the brigands of the country, and not met with any organised resistance. General Pollock, however, marched with the 1st Division, which led the way. The brunt of the fighting fell, as a matter of course, on the rear divisions, of which Nott and McCaskill were in command.

[5] "The Punjaub and the North-West Frontier of India," 1878.

Nott from Kandahar, and of Pollock from Peshawar in 1842-43, and observe the ease with which those Generals swept away all Afghan opposition, and then let him consider the incalculable improvement that has taken place in our weapons since that time, and reduce the question to a rule of three sum. If troops armed with the old 'Brown Bess,' and possessing only the artillery of that period, could drive the Afghans off the hills in 1842-43, what will a force armed with the Henry-Martini rifle, supplied with field-guns of marvellous precision, and with light mountain pieces which can go anywhere, be able to effect in 1878?" The writer of this did not foresee in 1878 what Major G. T. Younghusband,[1] writing in 1897, has been able to grasp, viz., that the advantage to be gained from improved fire-arms will not count in favour of our troops only. It is an indisputable fact, proved by the recent fighting, that now that the frontier tribesmen and the subjects of the Amir are armed with long-range breech-loading and magazine rifles, it will be more difficult to cope with them in the future than it has been in the past. Our troops pent up and jammed in defiles can be pounded from any range up to 2,000 yards, and only the most perfect working of advance, flank, and rear guards, and the thorough piqueting of all heights, can prevent heavy loss in all operations amid the difficult passes and defiles of Afghanistan. We have seen the Mamunds confronting General Jeffreys, and the Afridis General Lockhart, with numbers not superior to those of the force under the command of those officers. Yet in the old days so inferior was the fire-arm with which our soldiers and sepoys were armed, that in 1842 we find the Adjutant-General of the Army in India proposing to Brigadier Wild at Peshawur,[2] "to arm our troops for operations in mountain defiles with the weapon of the Afghan soldiery." Kaye tells us in his history of the war that "the British muskets were found no match for the Afghan jezails,"—and again, "the Afghans shot down our men with ease, and laughed at the musket balls."[3] Yet with those same muskets did our soldiers and Hindustani sepoys defeat the Afghans at odds of 5 or 10 to 1. The tribes on the N.-W. Frontier are now well provided with good rifles and ammunition, and nothing that the Government of India has been able to do has prevented them getting both. Disarmament, though strongly advocated in some quarters, has been pronounced impracticable. If we can keep these tribes friendly so much the better. If not, we must not forget the lessons learned in 1897 from the Afridis as well as others.

After the termination of the first Afghan War, the Government of India avoided as far as possible all complications with the Afridis. Now and again a small punitive expedition was sent against some section of them. In the winter of 1878-9, General Maude entered their country with three columns of 1,200 men each. The Afridis rose at once and gave General Maude a slight foretaste of their guerilla tactics.[4] The

[1] "Indian Frontier Warfare."

[2] Blue-Book on Afghanistan, 1843, p. 95.

[3] See also Vincent Eyre's "Operations at Kabul," pp. 66 and 115.

[4] See "Life of Sir Charles Macgregor," Vol. II.

Government of India directed General Maude to withdraw his troops, and so avoided further fighting.

One of the special features of the frontier fighting of 1897 has been the frequency of the night attacks. In the earlier annals of this warfare we find them taking place but rarely. The attack on Colonel Wymer's camp near Kolat-i-Ghilzai, referred to above, was made before darkness set in. General Sale's column in October, 1841, was frequently harassed and threatened at night but not regularly attacked. In 1860, at Palosi in Waziristan, the camp of our troops was attacked by the Mahsud Waziris at daybreak just when our piquets were being withdrawn.[1] Our losses on that occasion were 63 killed and 163 wounded, in addition to 60 casualties amongst the levies. The Mahsud Waziris, when finally repulsed, left 130 dead behind them. The affair at Wano, three or four years ago, was but a repetition of that of Palosi. From the 26th July to the 1st of August last, the camp at Malakand and the Fort of Chakdara were attacked night after night. On 30th of August the Balish Khel post, on 14th September General Jeffreys' camp, on 16th September the camp at Sadda, and on 20th September General Blood's camp at Nawagai, were each in turn attacked at night. The Afridis, however, made no night attacks. It is possible that the frontier tribes have realised, as well as more civilised races, that rapid-firing guns and rifles can be best faced when darkness nullifies aim. At any rate, night attacks must always be reckoned with for the future.

The point which of all others, perhaps, this *résumé* of our fighting experiences in Afghanistan and Yaghistan impresses most forcibly on our attention is, that the European regiments and Hindustani sepoys of the East India Company of the old days, armed only with inferior muskets, held their own and won victories against greater odds than our British troops and Sikhs and Gurkhas, armed with the Lee-Metford and Martini-Henry rifles and machine guns, have done in more recent years. We have seen the old Hindustani sepoy pass into disrepute and we have seen the old long-service soldier give way to Mr. Cardwell's attempt to imitate the Prussian military organisation; but we have not seen that the modern creation of our military experts has done better work than the old school.

We find in the writings or memoirs of the men who won fame in the first Afghan War and in the years that immediately followed it, expressed opinions of the soldierly value of the various native races with whom they had served. These opinions are of great interest. Time has set the stamp of soundness on some and shaken belief in others. Some of the foremost frontier soldiers of those days thought but little of the Afghans. General Nott had the firmest belief in the power of our Hindustani sepoys to thrash them. It is a fact perhaps not generally known that on the spot where Sir Frederick Roberts on 1st September, 1880, with 10,000 picked troops[2] from Kabul, plus the Kandahar garrison, defeated Ayub Khan's levy of 15,000 to 20,000 Afghans, General Nott

[1] Vide "The Punjab and the North-Western Frontier," p. 24.

[2] British, Sikh, Gurkha, Pathan, and Panjabi.

had on the 29th May, 1842, with 1,500 men defeated 10,000 Afghans. In his account of this action Kaye[1] quotes the following extract from one of General Nott's private letters:—"You will hear enough of our affair of the 29th with the enemy. The troops behaved well, and I am really surprised that our loss was so trifling, but I have remarked that the Afghans fire high. *Our sepoys are noble fellows; 1,000 are fully equal to 5,000 Afghans or more.*[2] A detail of the 1st Cavalry under Chamberlain behaved very well indeed. The enemy had some 8,000 men in position, and 2,000 in reserve. We had 1,500 of all arms in the field. The enemy have broken up. I expect Wymer back in a day or two, when I will drive the rebels out of the Kandahar district. How I should like to go to Caubul! It is wonderful that the people in Hindustan should be so panic-struck; and they seem to believe that our sepoys cannot stand the Afghans! Now I am quite sure, and should like to try it to-morrow, that 5,000 Bengal sepoys would lick 25,000 Afghans." A month or two later Nott did march from Kandahar to Kabul with a force[3] about equal to that with which Sir Donald Stewart marched the same road in April and one-third less than that with which Sir Frederick Roberts marched the reverse way in August, 1880. Nott's troops had the "Brown Bess," while those of Stewart and Roberts had the Martini-Henry and Snider. The Afghans in both cases had the jezail. The fire-power of Stewart's and Roberts' columns was relatively man for man three or four times that of Nott's. Broadfoot (Memoirs, p. 161) thus succinctly puts on record the sum of the work done by Nott during this march:—"With his well-equipped and efficient little force he defeated the Afghans wherever they could be induced to oppose him." Would we in these days speak of a column with "10,000 camels, plus bullocks, asses, mules, and tattoos," and carrying 40 days' supplies, as a well-equipped and efficient little force? Sir F. Roberts did the march in 17 days, and his transport averaged one mule or pony per man of his force. However, hampered as he was with an enormous baggage train, Nott did the work allotted him, and that right well. Although Major George Broadfoot records that Nott's troops defeated the Afghans wherever they met them, he none the less gives it as his opinion that albeit both the Gurkhas and the Hindustanis are good and brave soldiers, the Afghans are the bravest of the three, and he elsewhere (p. 149) distinctly implies that their failure to cope with our troops was due to want of arms and organisation. To quote his own words:—

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[1] Vol. III., p. 316.

[2] Vide Afghan Blue-Book, 1843, Letter No. 377, from General Nott to General Pollock; and "History of the War in Afghanistan," by C. Nash, chap. xiii.

[3] Vide Stocqueler, p. 289, and Allen's Diary in Sind, p. 218, who says:—"The number of fighting men did not, I believe, exceed 7,000." The followers were at least double the number of the fighting men, and the column carried provisions for 40 days. They had, loaded with baggage, provisions, and ammunition, 10,000 public and private camels, besides bullocks, asses, mules, and tattoos. Sir F. Roberts had 10,000 mules and ponies, all told. His column was far more mobile and far more easy to protect than Nott's. Mr. Allen in his Diary gives a list of all the regiments and corps that composed Nott's column.

"The Afghans are masters in mountain warfare, individually brave, yet cautious and watchful; skilful in choosing ground, and of a coolness never to be disconcerted; swift to advance, timely in retreat, and expert in both; their masses were but seldom shown, hardly ever uncovered to our fire, yet never far away when a blow could be struck. This will apply to all Afghans but pre-eminently to the Eastern Ghilzais and Eusufzais. Better arms, organisation, and leaders would make them troops of the highest order; the want of them rendered the largest assemblages unworthy of the name of armies." John Nicholson, it is evident, had no such high opinion as Nott of the Hindustani sepoy. He came of a later school, the Lawrencian school in the Punjab, which had seen the Bengal sepoy fail before the Sikhs, and was contemporary with all that led up to and culminated in the Mutiny. Yet did he recognise the fact that these sepoys led by British officers could defeat Afghans? He writes thus to a friend in 1856[1]:—"In Afghanistan even our Native Infantry—save in the snow—*never* fought unsuccessfully, and many of the regiments were indifferent enough, and with anything but heroes for leaders. I fear, however, that while our leaders will bear in mind the disasters occasioned by incompetence without a parallel, they will ignore the lessons taught by the successful advances of Pollock and Nott, in the face of the whole Afghan nation, through as difficult a country as any in the world, and with no loss to speak of, though our infantry in those days had neither percussion locks nor rifles." General John Jacob, on the other hand, had the strongest belief in the merits of the Hindustani Mahomedan and the most uncompromising dislike for the Pathan and the Baluch. His corps of Sind Horse was composed entirely of Hindustani Mahomedans and with them he inflicted many a crushing defeat on the Baluchis. The Baluch is as stout a fighter as the Pathan—witness the defeat of Major Clibborn's column at Nefoosk,[2] the defence of Sibi, the investment of Captain Lewis Browne's force in Káhun,[3] and many a stern encounter between the Sind Horse and the Baluchis on the Sind Frontier between 1840 and 1850, and finally, the recent action near Turbat, between 1,300 rebel Baluchis and a small force of 150 rifles, 30 sowars, and two guns, under Lieut.-Colonel Mayne. General Jacob, on the other hand, had a very poor opinion of the Bengal sepoy, alias "Pandy," and considered the Bombay sepoy much superior to him. It has been the fashion of recent years, especially with the Upper India Press, to decry the Bombay sepoy, as well as the "Pandy." The faith of public opinion and of all expert authorities has been pinned for the last 30 years or more on the Sikh, the Gurkha, and the Pathan. Public opinion is a weather-cock, and the estimates of experts are not perhaps more reliable. We have

[1] Vide Kaye's "Lives of Indian Officers."

[2] The defeat of Nefoosk, the repulse of our troops from Sibi Fort and the siege and surrender of Captain Browne's force at Káhun are three events of interest and moment to which Kaye, in his "Afghan War," does not even allude.

[3] Vide Stocqueler, pp. 98, 115, 118, "Views and opinions of General Jo Jacob," by Captain Lewis Pelly.

shown, at any rate, that in the last 60 years they have varied considerably. "Who shall decide where doctors disagree?" The evidence of 60 years attests the fine fighting qualities of Sikh, Pathan, and Gurkha; while the Bengal and Bombay sepoy can claim the meed of honour and glory won on many a battle-field since Plassey.

When the Government of India, in the autumn of 1897, decided to send an expedition into the country of the Afridis, such a force was assembled near Peshawur and Kohat as, it was considered, would render success more than probable. It has been the policy of the Government, ever since the Ambéla affair, not to send weak forces against the frontier tribes. With 30,000 men it seemed to be a moral certainty that Sir William Lockhart would worst the Afridis and easily reduce them to submission. The result has not been what was expected. The Afridis, except at Dargai, never met our troops in fair fight. Their villages and forts were burnt and their country ravaged; but in action no great loss was inflicted on them (if they suffered severe loss, it was not known), while their families and their movable property were all safe in the Ningrahár District of the Amir's territory. The Afridis, on the other hand, on four notable occasions, as well as on several minor ones, handled our retreating forces most severely. There are grounds for inferring that, under those circumstances our troops should halt, assume the offensive, and if need be camp out for the night. Colonel Haughton did so, because he saw (in the retirement from the Waran Valley on the 16th November), that it was the one chance of saving the rear-guard troops. He *did* save them. Major Downman, of the Gordon Highlanders, did the same thing in the retreat down the Bara Valley on the 11th December. Both officers spent the night out and brought their troops into camp next morning with but little loss. It is worth while recalling that when Sir James Outram, early in 1857, was falling back from Borasjun to Bushire by night, he was followed up and attacked by the Persians, who even brought up guns and opened fire on his column. Sir James halted and remained on the defensive till daybreak, when he attacked and drove off the Persians.

All the facts that we have quoted from the accounts of our earlier warfare with the Afghans show that the Afridis employed no tactics against our troops in 1897 that they and every other Pathan tribe had not employed against them ever since 1838. When Sale on the 28th October, 1841, found his rear guard sorely pressed, he detached troops from his main body to extricate it. They did so, and the whole force was safe in camp before dark. When Nott's rear guard in October, 1842, was harried by the Pathans and benighted, four or five companies of the 40th and 41st British regiments went out after dinner, drove off the Pathans and brought in every man, killed, wounded, or untouched. Was it easier to do this, in those days when our troops had only the "Brown Bess" against the jezail, than it is now when they have breech-loader *v.* breech-loader? It would seem to have been so, though ordinary reasoning points the other way. Years ago, Captain F. N. Maude, in one of his best military essays, dealing with the effect of

modern arms on warfare, contended that, whatever the arms, the issue must really rest with courage, physique, and discipline. Now abundant proofs can be quoted to show that the courage, discipline, and pluck of our troops in Tirah were all that could be desired. Saragheri, Gulistan, Dargai and several hard-fought retreats bear witness to this; and more than these, the steady patient endurance by all ranks of great hardships—those nights in the bitter cold without food or clothing and with the enemy on every side; those weary marches in wet and slush and snow under the enemy's fire. It is not the losses in these rear-guard actions that call for comment. The instances that we have quoted from earlier frontier campaigns show that loss, serious loss, is almost inevitable. It is to the causes of these losses, some of which we have already specified, viz., failure to give adequate support to the rear guard, and allowing the troops to be overtaken by darkness in an intricate, unknown country infested by hostile tribesmen, that attention is needed. Never did Pathans adhere more steadily to the tactics in which they excel than did the Afridis in this Tirah campaign. They never once faced an attack. They never once gave our troops a chance of "getting in" at them. No style of fighting could be more trying to morale. Our best frontier officers and soldiers found themselves foiled and at times were worsted by these unorganised guerillas. Surely the inference to be drawn from this is that in the future Her Majesty's officers and soldiers must be systematically educated to fight these uncivilised foes. It is not a matter to be left in the hands of irresponsible and unofficial essayists. It is one to which the War Office and the Horse Guards should give their attention. A manual of instruction in uncivilised warfare is required. Her Majesty's troops, and more especially those stationed in India and in our colonial possessions, should be instructed and practised, not only in the exercises and manœuvres prescribed for modern European warfare, but also in the irregular methods of fighting which must be adopted against uncivilised races. The most essential point in which we believe our soldiers, and more especially our British soldiers, to have shown some shortcoming, is in physique and in capacity for mountaineering work. It is not without cause that at first 200, and afterwards from 500 to 600, Gurkha scouts were organised to meet the Afridis at their own game. We have a full explanation of the cause from the very best authority, the Farewell Order to the Indian Army of 21st March last, by Lieut.-General Sir George White, the distinguished soldier who led the 92nd to the frontal attack at Charasia and to the capture of the Pir Paimal ridge at the battle of Kandahar, and whose old corps it was that carried the heights of Dargai. He, if anyone, knows what the British soldier can do, and ought to be able to do, against the Pathan on his native hills. Let his order speak for itself:—

"Although brilliant exceptions exist, the bulk of our infantry are insufficiently trained in the theory and practice of hill-warfare, the class of service for which the most constant and the most severe calls are made on our Army. It is true that at very many stations no ground exists

where this can be practically taught, but there are others, especially those in the hills, where full opportunity for such training is afforded. In those latter cantonments troops should be worked more consistently and for longer hours over the most difficult ground available, and practised in all the requirements and incidents of hill warfare, so that the officers and men may not only be acquainted with the theory of hill-fighting, but may also be at all times kept physically fit for it by constant practice."

This order is a legacy to future Commanders in India, and a timely note of warning to the British Army all the world over. To apply it we must go to the fountain-head, and that is the Recruiting of our Forces. Unless the Army is composed of good recruits all training is in vain. A fine soldier cannot be made from an unsound constitution. For recruiting Her Majesty's Government is responsible. It rests with that Government to impress on the nation that in order to have a good Army in Great Britain, where compulsory service is unknown, money must be forthcoming. The nation must pay for the privilege of exemption. Good recruits must be well paid, and without good recruits there cannot be a good Army.

Given an Army recruited on this principle, it rests then with the Army itself to see that that Army is made as efficient as possible in physique, discipline, and mobility to meet the enemies, against whom in the interests of the nation it is called upon to take the field. The Commander in India who is determined to maintain his troops in a state of physical efficiency has no light task before him. We presume to start with that the corps and drafts sent out to him from home are physically sound. He has to contend, first of all, with a climate that for six or seven months in the year militates against active exercise, except in the hills. He has to contend against the reluctance of many to take such exercise at all. He must upset existing prejudices about health and exposure to the sun, wage war against indifference and, possibly, obstruction, and insist that the British soldier in cantonments must work rather than be worked for. He must suppress "molly-coddling" of every kind. Only by these strenuous measures will he break down the *vis inertiæ* which at present leaves the British soldier to drone away the long, long Indian day, solacing it often with too much drink and too much sleep. Much is at present done *for* the British soldier which might be done *by* him. If he is worked regularly and yet in moderation, he will be a healthier and a happier man, and a better soldier. We shall hear less of his "grumbling," of which there is at present more than enough. Let any Commander in India introduce reforms on these lines, and improved physique and efficiency will follow. The days of Light Companies are past, grand work though they did under Nott and Sale and others in the first Afghan War. In these days we want all our infantry trained as far as possible up to the same standard. In a mountain battery there is no question of one man being able to climb a hill and another unable; they must all do it. In a battalion of 1,000 men it is not, humanly speaking, possible to have every soldier ready at a moment's notice to embark

on a hill campaign, and hold his own for activity and endurance against tribesmen born and bred in the hills. But 500 such men should be found in the battalion, while the other 500 perform the many ordinary duties of the line of march and the line of action. The British Army will surely not be content to resign Light Infantry duties to Gurkha scouts. Its ambition should be that every man in it, be he Briton, Sikh, Pathan, Gurkha, Punjabi, or even the less esteemed sepoy of the Bengal, Madras and Bombay Presidencies, may be efficiently trained "in the theory and practice of hill warfare," and that every battalion may be able to put in the field its own quota of "scouts" if we are again involved in warfare on the North-West Frontier.

Canadian Pacific s.s. "Empress of India," May, 1898.

NAVAL NOTES.

HOME.—The following are the principal appointments which have been made: Captains—J. L. Marx to "Proserpine"; M. P. O'Callaghan, C.B., to "Royal Sovereign"; S. H. M. Login to R.N. College, at Greenwich; C. J. Barlow, D.S.O., to "Jupiter"; C. H. Cross to "Galatea"; Count F. Metaxa to "Alexandra"; F. O. Pike to "Champion"; A. Macleod to command of Fleet Reserve at Chatham. Commander—G. F. Knowling to "Icarus."

The new third-class cruiser "Proserpine" was commissioned on the 7th ult. for service on the North-American and West-Indian station, where she will relieve the first-class gun-boat "Partridge"; she left for her destination on the 27th ult., and the strength of the squadron will be materially increased by her arrival; before leaving she had a very satisfactory commissioning trial under natural draught, the results being as follows:—Steam, 245 lbs.; vacuum. 24·2 inches; revolutions, 186·5; I.H.P., 5,074·6; speed, 18·1 knots; air pressure, 1·78 inches. The third-class cruiser "Comus" is to be commissioned to relieve her sister-ship the "Cordelia" on the North-American station, where, for six months in the year, she is employed as the senior officer's ship on the Fishery Duties. The new second-class cruisers "Isis" and "Dido" have left for the Mediterranean, where they will relieve the "Astræa" and "Forte"; they are convoying to Malta the new 30-knot torpedo-boat destroyers "Earnest" and "Griffon," which on their arrival will be attached as tenders to the battle-ships "Cæsar" and "Illustrious" respectively. The first-class torpedo gun-boat "Salamander" has been commissioned to temporarily relieve the third-class cruiser "Scout" in the Mediterranean until the new third-class cruiser "Perseus" is ready for commissioning, when she will proceed to the Mediterranean to fill the vacancy. The two new shallow-draught river gun-boats "Sandpiper" and "Woodcock" are being sent out in sections to Hong-Kong; on arrival they will be put together, and be commissioned as tenders to the "Tamar," the commodore's ship at that port. Two new 30-knot destroyers were launched last month—the "Orwell," from the yard of Messrs. Laird, and the "Cynthia," from Thornycroft's works, at Chiswick. The sloop "Melita" is to be recommissioned at Malta for a further term of service on the Mediterranean station, and a new crew is being sent out to Malta for her.

The first-class cruiser "Terrible" has concluded two more steam trials, with, on the whole, very satisfactory results. The first trial was an eight hours' run in the Channel at a nominal H.P. of 22,000, but the actual mean of the eight hours was 23,053. The ship drew 27 feet 6 inches forward and 29 feet 6 inches aft, or more than a foot in excess of her draught when she ran her 18,000-H.P. trial, and the excess of draught over the previous trial is regarded as accountable for the lowness of the speed as compared with previous results. The steam in boilers was 235 lbs. to the square inch, and there was a mean vacuum of 25 inches. The revolutions were 104·3 per minute, and the coal consumption was 2·14 lbs. per H.P. per hour, which was not regarded as excessive, considering the inferior quality of the coal. The speed as taken by patent log was 20·7 knots, but throughout the trip there was no vibration, and the trial answered expectations. The last trial was a four hours' run at 25,000-H.P., the ship at the time having in her bunkers within·50 tons of her full coal-stowage of 3,000 tons, the draught being 26 feet 10 inches forward and 29 feet 5 inches aft, while the steam in the boilers was 235 lbs. to the square inch. Leaving Spithead at six o'clock she

had attained her maximum power at eight o'clock, and ran along the south coast to the eastward as far as Brighton, when she turned for a run to westward. At a quarter to ten, when nearing the Owers lightship, she ran into a fog and had to ease down; but the fog thickened, and at ten o'clock the anchor was dropped. By three o'clock in the afternoon, when the weather cleared, the ship made a fresh start, and the trial was renewed on the full power being realised at four o'clock. It was then intended to run a continuous four hours' trial, and the power was so steadily increasing that it was hoped to exceed 26,000-H.P.; but soon after half-past six another fog was run into, and, as a continuous four hours' run was impracticable, it was determined to combine the mean results of the morning and afternoon runs for the purpose of the official report. This showed that the vacuum was 25 inches starboard and 24½ inches port, and the revolutions were 108·63 starboard and 108·51 port. The I.H.P. was 12,618·5 starboard and 12,493·6 port, or a collective of 25,112·1-I.H.P. Owing to the high rate of speed the patent log was frequently found to be racing, and the actual speed was in excess of that recorded, but even under these uncertain conditions it showed a speed of 21·9 knots. Unfortunately the machinery has since developed some defects, which will detain her in the dockyard hands for a month or six weeks. According to the latest news from China the "Terrible's" sister-ship, the "Powerful," seems to have completely got over her troubles, as the difficulties experienced on the voyage to China with the crank and main bearings have now all been overcome. Many trials at various speeds and power have since been run, and have been got through with complete success. On July 29th the vessel completed a 24 hours' fast run, accomplishing a distance of 472 miles, which gives a mean speed of nearly 20 knots; this was done in a tropical temperature, and with the ordinary coal picked up on the station; for a part of the 24 hours the engines were run at over 22,000-I.H.P., and this was considered enough until the bunkers were replenished with fuel, as the vessel had had various runs before this last 24 hours' spin. The subsequent run from Wei-hai-wei to Yokohama—a distance of 1,200 miles—was done under easy steaming in 66½ hours; for eight hours the ship averaged 20·7 knots, for 13½ hours 19 knots, and for the remaining three days' steaming the average speed was 17·5 knots.

Principal Results of Trials of H.M.S. "Terrible."

Date of trial	May 4-7, 1898	June 25-27, 1898	August 13-16, 1898	August 29-31, 1898	September 13, 1898	September 14, 1898
Where trial took place	Channel	Passage to Gibraltar	Channel and Atlantic Ocean		Channel	Channel
Duration of trial	60 hours	60 hours	60 hours	60 hours	8 hours	4 hours
Draught of water Forward	27 ft. 9 in.	28 ft. 2 in.	26 ft. 7 in.	27 ft. 5 in.	27 ft. 6 in.	26 ft. 10 in.
Draught of water Aft	27 ft. 5 in.	29 ft. 5 in.	29 ft. 4 in.	29 ft. 6 in.	29 ft. 6 in.	29 ft. 5 in.
Steam in boilers... lb.	217	230	222	233	240	240
Vacuum in condensers in.	26¾	26½	26	25½	25	25
Revolutions by counter	64	81·26	93·66	98·38	104·2	108·6
Average I.H.P.	5,084	10,246	15,554	18,515	23,050	25,115
Total distance run sea miles	758·4	1,020	1,176	1,218	—	—
Average speed ... knots	12·64	17	19·6	1st 30 hours = 20·1 2nd 30 hours = 20·5	20·7*	22
Total consumption of coal during trial for all purposes ... tons	313·2	519	859·4	1,081	—	—
Consumption per I.H.P. per hour for all purposes ... lb.	2·3	1·89	1·96	2·17	2·14	2·11
Description and quality of coal	Welsh, good but small	Welsh, good	Welsh, 6 to 7	Welsh, 5 to 6, small and of fair quality	Welsh, small	Welsh, small
State of sea	Slight	Smooth	Slight	Moderate to swell	Smooth	Smooth
Wind, force	2 to 5	1 to 2	—	5 to 6 1st 30 3 to 2 2nd 30	1 to 2	1 to 2

*Logs incorrect, jumping out of water.

The new first-class cruiser "Diadem" has also been continuing her trials; she started for a 60 hours' run, with orders to approximate as nearly as practicable her maximum of 16,500-I.H.P. As the vessel has only recently been commissioned the stokehold hands were new to the ship, and numerically are only the ordinary complement. It was therefore not expected that, over so protracted a trial, the H.P. would exceed 14,000, though, as a matter of fact, the mean was 14,933. The draught of the ship forward was 25 feet 3 inches, and aft 27 feet 4 inches, and the steam in boilers was 250 lbs., with a vacuum of 26·7 inches starboard and 26 inches port. The revolutions were 112·15 starboard and 112·38 port, which gave the ship a mean speed of 19·7 knots on a coal consumption of 2·1 lbs. per unit of power per hour. The trial was satisfactorily carried out until the 57th hour, when it was found that the bearings of the port engine were becoming over-heated, and the run was not continued.

The first-class cruiser "Edgar" has been undergoing a series of trials after her refit, in which she has fully maintained her old reputation as a fast steamer. Owing to the large proportion of North-country coal in her bunkers the engineering department had great difficulty in running the engines at the required power, but notwithstanding this the vessel attained practically the same speed as was recorded of her nine years ago, when she ran her contractors' trial at 10,000-I.H.P. On a run of two hours with the natural draught the mean results were:—Steam, boilers 139 lbs., engines 134 lbs.; vacuum, starboard 27·5 inches, port 27 inches; revolutions, starboard 86, port 86·7; I.H.P., starboard 4,368, port 4,628—total 8,996; air pressure, nil; speed, 18·8 knots. The Devonport officials are highly pleased with the results, as since May, 1893, when the vessel was first commissioned, she has served a commission on the China station, has made three long trips on transport service, and in Dockyard repairs cost less than £10,000. She has thus proved to be one of the most serviceable vessel of her age in the Navy.

The new third-class cruiser "Perseus" has satisfactorily concluded her eight hours' natural-draught trial, the results being as follows:—Steam pressure, 251·5 lbs.; vacuum, 25·3 inches; revolutions, 195·8; I.H.P., 5,238·8; speed, 19·1 knots; coal consumption, 2·27 lbs. per H.P. per hour. The H.P. was 238·8 beyond the contract power. The "Perseus," which has been built and engined by Earle's Shipbuilding Company, will next be tested under forced draught, when her engines will be required to indicate 7,000-H.P. on a four hours' run. The new third-class cruiser "Pactolus" has also concluded her eight hours' natural-draught trial with the following results:—Draught of water—forward 11 feet 2 inches, aft 15 feet 4 inches; speed of ship, 19·1 knots; steam pressure in boilers, 257 lbs. per square inch; vacuum in condensers, 24·9 starboard, 25·7 port; revolutions—201·3 starboard, 194·2 port; I.H.P., high—887 starboard, 910 port; intermediate—983 starboard, 859 port; forward, low—872 starboard, 917 port; total, 2,742 starboard, 2,686 port; grand total, 5,428. The consumption of coal was not taken. The results of the 30 hours' coal-consumption trial of the new third-class cruiser "Pegasus" have also proved satisfactory. The following are the details:—Draught of water forward, 11 feet 8 inches; aft, 15 feet 7 inches; steam pressure in boilers, 261 lbs. per square inch; vacuum in condensers, starboard, 25·9; port, 26·5; revolutions per minute, starboard, 175·7; port, 177·1; H.P., 3,698; speed in knots, 17·26.

The new first-class cruiser recently ordered by the Admiralty from Messrs. Vickers, Sons, and Maxim, Barrow-in-Furness, is to be called the "Euryalus," and the other cruiser of the same type, ordered from the Clydebank Shipbuilding Co., Glasgow, is to be named the "Bacchante." These vessels will be very similar to the cruisers of the "Cressy" type. Their principal dimensions will be:—Length, 440 feet; beam, 69 feet 6 inches; mean load draught, 26 feet 3 inches; displacement, 12,000 tons. Their engines, which are to be driven by water-tube boilers, are to be capable of developing 21,000-I.H.P., which are expected to

give a speed of 21 knots. The vessels will be sheathed with wood and copper, and will have a coal-stowing capacity of 800 tons. Their armament will consist of two 9·2-inch breech-loading guns, twelve 6-inch and seventeen smaller Q.F. guns, twelve Maxim machine guns, and four submerged torpedo-tubes.

On the subject of the number of hands required in the stokeholds of ships fitted with water-tube boilers, a statement of considerable interest has been communicated to the *Marine Engineer* by Mr. J. Gretchen, of the Russian Volunteer Fleet. He confirms the statement that more men are required for water-tube boilers than for cylindrical boilers of the same power, and proceeds to give particulars in support of this. There are in the Volunteer Fleet three vessels practically of the same size, and generally steaming with the same power. One —the "Kherson"—is fitted with Belleville boilers, and the other two—"Petersburg" and "Saratov"—have ordinary cylindrical boilers. The number of men employed on the voyages to the Far East are as follows :—

	Machinists.	Stokers.	Helpers.	Total.
"Saratov"	16	30	17	63
"Petersburg"	16	30	17	63
"Kherson"	22	34	18	74

During the maiden voyage of the "Kherson" it was found that the number of stokers was not sufficient for carrying out all the work, and accordingly four stokers and two helpers were added. As the result of experience with the "Kherson," the company are providing for the new steamer "Moskov," now being completed by the Clydebank Company, 22 machinists, 38 stokers, 27 helpers; a total of 87 men. The reasons Mr. Gretchen gives for the necessity of providing more men where Belleville boilers are concerned are :—Firstly, coal consumption is higher than with Scotch boilers. The difference, in his experience, was at least 10 per cent. in the case of Welsh coal, and sometimes 30 per cent. with Japanese and other smoky coal. Secondly, firemen's work is harder, because firing must be continuous and the fires cleaned oftener. The result is that intervals between work and rest are short, and a man has practically no rest during watch. Thirdly, there is extra work for firemen on account of cleaning tubes when under steam and putting boilers in order after steaming. Further, there are more mountings and small parts, more brickwork, etc., requiring attention and labour. The number of machinists in the case of the "Kherson" is larger owing to the greater number of joints in the boilers, and also on account of a great amount of auxiliary machinery and the more or less complicated apparatus in connection with the boilers : feed pumps, air-blowers, automatic feed regulators, blow-off apparatus, reducing valves, etc. To keep all these items in order requires increasing work on the part of the machinists in charge of the boilers.

A return lately issued as a Parliamentary paper shows as nearly as possible the percentage of seamen and stokers who on termination of their first engagement (*a*) re-engage at once; (*b*) leave but return within 12 months; (*c*) leave but return after twelve months; (*d*) leave and do not re-engage. The paper, which is in continuation of Parliamentary paper No. 189, of Session 1894, gives the figures for the years 1892-95 inclusive. The figures for 1895 show that of the seamen 65·8 per cent. re-engaged at once, and 22·6 per cent. left and did not re-engage at all; of the stokers 83·40 per cent. re-engaged at once, while only 6·80 per cent. finally quitted the Service.

Naval Prize Money.—A Parliamentary paper has just been issued showing the receipt and expenditure of naval prize, bounty, salvage, and other moneys, between April 1st, 1897, and March 31st, 1898. The return is full of curious and interesting information relating to operations the most of which have by this time passed into the region of history. This information, as might be expected, is to be found principally in the "unclaimed share account prior to April 1st, 1865." Thus, of the bounty money awarded to the officers and crews of Her Majesty's

ships, under various votes of Parliament, for the destruction of pirates, there remained £3,980 3s. 6d. on March 31st last; of a portion of the booty captured in Pegu by the naval and military forces in 1852-53, allotted to the officers and crews of Her Majesty's ships, there remained £884 3s. 3d.; of the booty captured at Canton on December 28th and 29th, 1857, there remained of the sum awarded to the naval squadron £1,140 13s. 3d.; of the 30 days' additional pay voted by Parliament to the naval forces employed on the China station between October 1st, 1856, and June 26th, 1858, there remained £5,851 15s. 11d.; and of the net proceeds of the junks captured in the operations following the breach of the blockade of the Canton river in 1857 there remained £1,064 16s. 9d. There is a curious reminiscence of the part which the Navy played in suppressing the Indian Mutiny in the shape of two sums remaining on April 1st, 1897—the first, £300 19s., being the balance of shares allotted to the naval brigade of H.M.S. "Shannon" employed at Lucknow, and the second, £434 12s. 11d., being the balance of shares of the Satassee booty captured by the Sarun Field Force on January 11th, 1858, allotted to the Naval Brigade of H.M.S. "Pearl." Out of these two sums was paid, for some purpose which does not appear, £1 4s., leaving a balance, on March 31st last, of £734 7s. 11d. On that date also there remained a balance of £7,009 11s. 7d. from the grant of Parliament for stores captured at Kertch and Yenikale in 1855 by the naval and military forces, allotted to Her Majesty's ships, and a balance of £6 5s. 11d. from the shares allotted to the naval brigade (seamen of H.M.S. "Dryad," "Octavia," and "Satellite"), out of the sum of £2,000 given by Her Majesty's Government for the crown and chalice taken at Magdala. The total balance of the unclaimed share account on March 31st last was £3,969 6s. 11d., and of the Government percentage account £14,111 8s. 5d. It should be stated that the sum of £36,000 (in addition to the £173,000 referred to in the annual account for 1854-55), was transferred to the Consolidated Fund between April 1st, 1855, and March 31st, 1865, but is available for the payment of any claim which the Naval Prize Cash Balance may not be sufficient to meet. The amount of shares forfeited by desertion, etc., was £1,957 7s. 1d. on March 31st. Various sums were paid on account of captured slavers during the year to H.M.S. "Barrosa," "Lapwing," "Philomel," "Thrush," and "Widgeon." There remained on March 31st a balance of £183 14s. 11d. from the amounts allotted to officers and crews of Her Majesty's ships on account of captures of cargoes and vessels for breach of the Foreign Enlistment and Merchant Shipping Acts, etc., and a balance of £2,604 11s. recovered from owners for salvage services rendered by Her Majesty's ships.—*Times* and *Naval and Military Record.*

AUSTRIA-HUNGARY.—An unofficial trial was lately made of a first-class sea-going torpedo-boat built by Messrs. Yarrow and Co., of Poplar, to the order of the Austro-Hungarian Government. The vessel is one of four that have been constructed for the Austrian Navy at the Poplar yard, and the securing of the order in this country is satisfactory from the fact that it has been obtained in open competition with Continental yards. Some time ago the Austro-Hungarian Government asked for tenders for a single vessel of this type in order to obtain information as to the best source of supply. Ultimately two firms were selected to build such a trial vessel, Messrs. Yarrow and Co. being one, and a well-known Continental firm the other. Messrs. Yarrow produced the "Viper," which ran some very successful trials, reaching a speed of 26½ knots on a three hours' run with a load of 26 tons on board. The results of the trial and experience with the boat since have determined the Austrian Government to place the order for the four remaining boats with the Thames firm, and the "Boa," the vessel under notice, was the first to be completed. Like her three sister craft she is 152 feet 6 inches long and 15 feet 3 inches wide. She is constructed of galvanised mild steel, and is well sub-divided by tranverse bulkheads. In other respects she is of the ordinary design and construction, excepting that her scantling is somewhat

heavier than is usual, the Austrian naval authorities considering it wise to sacrifice something in the matter of speed to obtain additional strength. The armament consists of three pivoted torpedo-tubes for 18-inch diameter torpedoes, two placed forward and one aft, and two Q.F. 3-pounder guns. The vessel is propelled by a set of triple-expansion engines, having three cylinders respectively 18 inches, 26 inches, and 39½ inches in diameter by 18 inches stroke. The vessel is single-screw. There is one cylindrical condenser. There is the usual auxiliary machinery, such as electric-light engines, steam-steering gear, forced-draught engines, fresh-water condensers, electric ventilating fans, and pumping engines. Steam is supplied by two water-tube boilers of the Yarrow straight-tube type. The propelling machinery is capable of exerting 2,000-I.H.P. The bunkers carry sufficient coal to give a radius of action of 1,500 nautical miles at 10 knots.

On her official three hours' continuous trial the "Boa" carried a load of 44 tons and made a speed of 24·265 knots, the steam pressure being 180 lbs. per square inch, and the revolutions of the engines 340 per minute. On this trial the air pressure for forced draught averaged less than equivalent to 1 inch on the water gauge; a moderate head which compares well with the much higher pressures needed with the former type of cylindrical boiler.

The lower speed of this vessel compared with that of her prototype, the "Viper," is of course due to the additional load she carried on trial over that of the first built craft. The question of trial loads is one which has been a good deal discussed lately in naval circles, and some authorities have come to the conclusion that contractors are let off too easily in this respect. It has been said, and the statements were repeated during the recent trip, that the 30-knot speed of the 200-foot destroyers which had been built for various naval Powers is deceptive so far as it may be taken to indicate the active service speed of these vessels, because the 35 tons load which is imposed on their trials is not nearly sufficient to represent the armament and gear which a destroyer would have to carry on active service. However this may be, it is well known that these craft seldom, if ever, realise their trial speeds when in commission and fitted as they would be for actual service. To bring this comparison to actual figures it is pointed out that if the "Viper," carrying 26 tons, made 26½ knots, a destroyer of three times the displacement and three times the power should be loaded with 78 tons, under which conditions her speed would fall to about 27½ knots, so that there would only be 1 knot difference between the two vessels. As a matter of fact, however, it is considered desirable to give this first-class torpedo-boat the same torpedo armament as a destroyer, although the gun armament is heavier in the latter. As it has been decided to give the torpedo-boat a heavier proportionate armament, she should carry a heavier proportionate trial load in order to represent service conditions, and the naval designer must face the fact that in order to get a cheaper boat with a smaller crew he must sacrifice speed, supposing the heavy armament to be needed. A torpedo-boat such as the "Boa" would cost only about one-third as much as the destroyer, and would probably carry ten or a dozen fewer men, say, 30 for the torpedo-boat and 50 for the destroyer—although the complements differ somewhat widely with the various countries and under varying conditions. The subject, however, is one which should be treated quantitatively, and it would seem that a good case has been made out for increasing the trial load on destroyers.—*Times.*

FRANCE.—The following are the principal promotions and appointments which have been made: Rear-Admiral—P. A. Servan to command of Naval Division of Algeria. Capitaines de Vaisseau—E. P. Lormier to "D'Estaing" and command of East-Indian Naval Division; E. L. Turnet to "Magenta"; L. P. Noël to "Bouvet"; L. V. Marin-Darbel to "Pothuau"; J. A. De Surgy to "Amiral-Duperré"; C. A. Esmey to "Redoutable"; P. A. Houette to

"Formidable"; P. L. Chocheprat to "Charles Martel"; H. E. Boué de Lapeyrère to "Brennus." Capitaines de Frégate—P. L. Chocheprat to be Capitaine de Vaisseau; J. G. Receveur to command of Défense-Mobile at Lorient; P. E. Le Breton to "Linois"; A. J. Barry to "Vautour"; E. F. Le Prieur to "Condor."—*Le Journal Officiel de la Republique Française.*

The period of command of vice-admirals commanding-in-chief of a squadron has, by a recent decree, been extended from one to two years. Vice-Admiral Fournier hoisted his flag in the "Brennus," at Toulon, on the 1st inst., as commander-in-chief of the Mediterranean Fleet; and Vice-Admiral Salandrouze de Lamornaix will hoist his in the "Formidable," at Brest, on the 15th inst., in command of the Northern Squadron.

The first-class armoured cruiser "Bruix" and the third-class wooden cruiser "Éclaireur" have been ordered home from the China station; the "Bruix" will relieve the second-class cruiser "Catinat" in the Northern Squadron, and the latter ship then proceeds to the Pacific, where she will fly the broad pennant of the senior officer of the division. The last 24 hours' trial for coal consumption of the new first-class battle-ship "Gaulois" was very successful, the results being as follows:—The engines developed 9,200-I.H.P., the revolutions being 114 and the mean speed 16·5 knots; the stokehold doors were open, and the air-fans were worked simply for ventilation, while the coal consumption was only 695 grammes per H.P. per hour; at the 4,500-H.P. trial the number of revolutions was 90, the speed 13·6 knots, and the consumption per H.P. per hour was 598 grammes; at the last full-speed trial the engines developed 14,963-I.H.P. (463-H.P. over the contract), making 130 revolutions, giving a mean speed of 18·2 knots, the coal consumption was 808 grammes (1·9 lbs.) per H.P. per hour, while the consumption per square metre of grate-surface per hour was found to be 121 kilogrammes (266 lbs.), instead of an expected 150 kilogrammes (330 lbs.); her twenty boilers are of the Belleville type, with economisers. The new torpedo-boat destroyer "Dunois" carried out a trial at Cherbourg on the 28th September; the engines developed 6,000-I.H.P., giving a speed of 20 knots; but some improvement will have to be made in the ventilation of the stokeholds. The first-class battle-ships "Formidable," "Amiral-Baudin," and "Amiral-Duperré" have left Toulon for Brest, where, in accordance with the Minister of Marine's new scheme, they will form part of the new Northern Squadron. The second-class battle-ship "Courbet" is expected shortly at Brest, where she will be repaired, and undergo some alterations in her armament; three 24-centimetre (9·4-inch) and one 13·8-centimetre (5·4-inch) Q.F. guns will be substituted for two of the four 27·7-centimetre (10·8-inch) guns at present mounted, and some modifications will also be made in her armament of smaller Q.F. guns.

A decree published in the *Journal Officiel* of 1st September re-organises the central administration of the Navy. It groups the departments into three chief divisions:—

1. Ships of the fleet ready for sea and at sea under the direction of the Chief of the General Staff of the Navy, including all the *personnel* and *matériel*, preparation for war, and the defence of the coasts.
2. Ships of the fleet under construction, including all machinery and ship-building and repairing works at the dockyards.
3. General accounts of the Navy, including pensions.

The whole of the above being under the supervision of the Control Department directly under the Minister of Marine.

The object and intentions of the re-arrangement of the squadrons as given in last month's Notes is to make each as homogeneous as possible, grouping the vessels of the same class and speed as far as possible together. M. Lockroy, the Minister of Marine, has stated that by next spring all the wooden vessels on foreign stations will be replaced by modern ships.

In view of the progress made in the application of electricity at sea, M. Lockroy has issued a circular calling for volunteers among the lieutenants to attend the courses of the Higher School of Electricity, Rue de Stael, Paris, which commence in November. A new rating is also to be introduced into the Navy of torpedo electrician. He has also decided that in future foreign officers will not be allowed to embark for instruction in the fleets, but only in certain vessels stationed on foreign stations, as it is thought unadvisable that foreign officers should witness the working out of the numerous problems of war in the fleets.

M. Lockroy has been continuing his inspection of the dockyards, and spent from 2nd to 4th September at Cherbourg. He inspected the "Henri IV." building, the "Hoche," the submarine-boat "Morse," and the torpedo-boats of the *Défense-Mobile*, he also went afloat and visited all the surrounding forts, including those on the breakwater. The defensive works were found in a most efficient condition, but as in the case of Brest it was considered that the numbers of the *personnel* available for manning the forts was insufficient. He visited Toulon on the 19th September, and inspected the transport "Bien Hoa," the new cruiser "D'Entrecasteaux," destined for the China station, and the cruiser "Pothuau," which will shortly hoist the flag of Rear-Admiral Maréchal in command of the Light Squadron of the Mediterranean Fleet. He also visited the submarine-boats "Gustave Zédé" and "Gymnote." On the morning of 20th September he embarked with his suite on board the flag-ship "Brennus," and at 7 a.m. the Active Squadron, consisting of the battle-ships "Brennus," "Charles Martel," "Magenta" and "Jauréguiberry," and the cruisers "Chanzy" and "Galilée," proceeded out of harbour for target practice.

The target was the old floating battery "Arrogante," 40 metres (131 feet) long and 5 metres (16 feet) high, and she carried her original armour in place. About 350 rounds were fired at her, when, contrary to expectation, after taking fire she was seen to heel over and founder in deep water. M. Lockroy was astonished at the result, and warmly congratulated Admiral Humann. On 19th March, 1879, this same "Arrogante" sank in a severe gale when at La Badine, near Hyères, the greater part of her officers and crew being drowned. She was subsequently raised and refloated, but this time she is sunk definitely for good and all. M. Lockroy left Paris again for Toulon for a voyage of inspection to Corsica and Algeria on the 3rd inst., and embarked on the 6th in the cruiser "Pothuau." On the 7th he arrived at St. Florent, Corsica, and he was also to visit Bastia and Ajaccio, Bonifaccio, and Porto Vecchio. On the 10th he was to proceed to Bizerta, and on the 14th to Algiers, returning to Toulon on the 19th inst.

The new first-class battle-ship "Iéna" was launched at Brest on the 1st September; the order for her construction was approved by the Minister of Marine in April, 1897, but she was not actually commenced until the 14th January last. The ship has been designed by M. Thibeaudier, Chief Naval Constructor at the Ministry of Marine, and is an improved vessel of the "Charlemagne" class, the principal improvements consisting in the substitution of 16·4-centimetre (6·4-inch) Q.F. guns for the 13·8-centimetre (5·5-inch) Q.F. guns in the earlier ships; an increase in the radius of action, and the protection of the upper works by light armour. Her principal dimensions are as follows:—

Length	400 feet 9 inches.
Beam	68 feet 2 inches.
Draught	27 feet 6 inches.
Displacement	12,052 tons.
I.H.P.	15,500.
Estimated speed	18 knots.
Normal coal supply	850 tons.
Radius of action at 10 knots	5,200 miles.
Coal supply, extreme	1,100 tons.
Corresponding radius of action at 10 knots...	7,000 miles.

The hull is constructed entirely of steel, and no wood is to be used even in the cabins and men's mess places. Protection is afforded by a complete water-line belt with two armoured decks, the one on a level with the lower edge of the belt and the other with the upper edge, while a belt of thinner armour extends from the heavy armour to above the main deck. The water-line belt is of hardened steel, provided partly by the Creusot firm and partly from the works of Marrel Bros. at Rives-de-Giers; its extreme thickness amidships is 14 inches, while it tapers off to 6 inches at the extremities; there is a 6-inch oak backing, and in the rear of that two thicknesses of ½-inch steel. The lighter armour is composed of two belts of 5-inch and 3-inch plates respectively, and will be carried up higher forward than it will amidships or aft; these plates are also of Creusot hardened steel. The armoured tube for the protection of the voice tubes and other means of communication will weigh 40 tons and be furnished by the Marrel Bros, as will also the conning tower, weighing 50 tons, with its hood of 1-inch steel. The armour decks will be of ¾-inch steel, which will be provided by the Guérigny firm. Cofferdams will run the length of the ship behind the light armour belt. The ship will have three screws, steam being supplied by twenty Belleville water-tube boilers fitted with economisers distributed in four stokeholds. The furnaces are arranged for using petroleum mixed with the coal. The engines will be supplied by the Forges et Chantiers de la Méditerranée; they will develop 15,000-I.H.P. giving 125 revolutions. Each set of engines will be in a separate compartment. The screws will be three-bladed, made of bronze, the diameter of the side screws being 13 feet 6 inches and of the centre one 14 feet 8 inches. The following trials will have to be carried out successfully before the engines are accepted:—

1. A four hours' full-speed trial with forced draught, the engines to develop 15,500 with a coal consumption not exceeding 0·94 kilogramme per H.P. per hour.
2. A twenty-four hours' trial at normal power under natural draught, the engines to develop 9,500-I.H.P., with a consumption of coal not exceeding 0·75 kilogramme per H.P. per hour.
3. A six hours' consumption trial, all fires alight, all three screws working, with natural draught; the engines to develop 12,500-I.H.P., the consumption of coal not to exceed 0·75 kilogramme per H.P. per hour.
4. A six hours' trial, natural draught, the engines developing 5,000-I.H.P.; the number of furnaces alight and of the screws working as the contractors choose.

In all these cases there will be a premium or penalty of 200 francs per gramme of coal in excess of or less than the stipulated quantity.

The armament will consist of four 30·5-centimetre (12-inch) guns, mounted in pairs in two turrets, one forward and one aft; the guns will be worked either by electricity or hand. With the electric fittings it is expected to be able to fire a round a minute. The secondary battery will consist of eight 6·4-inch Q.F. guns, which will be carried in armoured casemates on the main deck, as in the "Charlemagne," four firing from ahead to the beam and four from astern to abeam; eight 3·9-inch Q.F. guns, protected by shields, four of which will be carried above the centre casemates, the remaining four before and abaft the bridge. No information has yet been given as to the thickness of the turret and casemate armour, but in the "Charlemagne" it is 15·8-inch on the turrets and 3-inch on the casemates. There are also sixteen 1·8-inch and five 1·4-inch Q.F. guns, with thirteen 1·4-inch machine guns; four torpedo-tubes, of which two are submerged and two above water protected by their armour.

Commenting upon the value of the "Iéna" as a fighting ship, the *Yacht* considers that although she will be a formidable fighting unit, yet that a grave

defect exists through there being no protection below the casemates of the secondary battery, which are therefore liable to be seriously damaged by shells bursting under the deck, and it is of opinion that the system adopted in the "Masséna" class of carrying the 6·4-inch guns in turrets is preferable. As soon as possible the new first-class battle-ship "Suffren" is to be laid down on the slip from which the "Iéna" has just been launched.—*Le Yacht* and *Le Temps*.

THE NETHERLANDS.—The Naval Estimates for 1898 amount to a total of 15,522,474 gulden (£1,293,534), the principal items being as follows:—For administrative purposes, 381,591 gulden; for providing material and for ship-construction, 6,713,990 gulden; for pay, etc., 4,198,827 gulden; for pilot service and coast survey, 2,220,536 gulden; for pensions, half-pay, etc., 1,951,530 gulden; and for unforeseen expenses, 60,000 gulden. In the vote for material and ship-building, a sum of 1,166,980 gulden is devoted to construction in the Government yards, and a further sum of 1,934,000 gulden as an Extraordinary Vote for the same purpose; 623,000 gulden for guns and fittings; 310,100 gulden for torpedo material; 588,000 gulden for engines and boilers; 326,000 gulden for coal supplies; and 102,000 gulden for ship-building and fitting-out expenses in colonial yards. These Estimates are less by 19,842 gulden than those proposed last September by the late Minister of Marine, but in his statement, however, the present Minister intimates that money must soon be voted for the construction of an armour-clad for service in the Indies, and a further sum for general service; the plans of the new ship not being yet settled, so that her cost can as yet not be estimated, is the reason advanced for the necessary money not being demanded at present. A Supplementary Credit of 150,000 gulden would also be asked for later on for the preliminary work for the 5,000-ton battle-ship to be built next year. The Minister further declares that a sum of 50,000,000 gulden (£4,166,668) is necessary if the fleet is to be put on a proper footing to meet the exigencies of home defence and the defence of the colonies.

The new second-class cruisers "Holland," "Zeeland" and "Friesland" have all been commissioned this year; two of these vessels are to shortly proceed to the East Indies. Of the battle-ships of the "Kortenaer" class, two have been in commission the whole year, one remaining in the Reserve. The battle-ship "Koningin Wilhelmina" has been paid off and placed in the dockyard hands to receive new boilers and engines. The frigate "Tromp" is to be commissioned, while the cruisers "Van Speyk" and "Johan Willem Friso" remain in the Reserve. The fourth-class cruiser "Sommelsdijk" has been commissioned for service in the West Indies to relieve the third-class cruiser "Alkmaar," which returns home for overhauls and repairs. A sum of 469,800 gulden for guns and mountings, and of 299,400 gulden for torpedoes and fittings for the new second-class cruisers "Utrecht," "Gelderland," and "Noord-Brabant" is demanded, while a further sum of 982,000 gulden for these ships will be required next year. On the 15th July the new second-class cruiser "Utrecht" was launched from the Royal Dockyard at Amsterdam, her keel having been laid on the 22nd May, 1897. Her dimensions are as follows:—Length, 318 feet 6 inches; beam, 48 feet 6 inches, and displacement, 3,950 tons, with a draught of 17 feet 8 inches. The engines are to develop 12,000-I.H.P., giving a speed of 23 knots.

The new battle-ship, of which mention has been already made, for which a first vote of 150,000 gulden is to be demanded, will cost altogether 4,300,000 gulden. Her dimensions will be as follows:—Length, 312 feet; beam, 48 feet 10 inches, with a displacement of 4,950 tons. She will be protected by a complete water-line belt of nickel steel, extending from 1 foot 9 inches above the water-line to 4 feet below, its extreme thickness amidships being 6 inches tapering to 4 inches at the extremities, with an armour-deck 2 inches thick. Her armament will consist of two 24-centimetre (9·4-inch) guns, mounted in barbettes, one forward

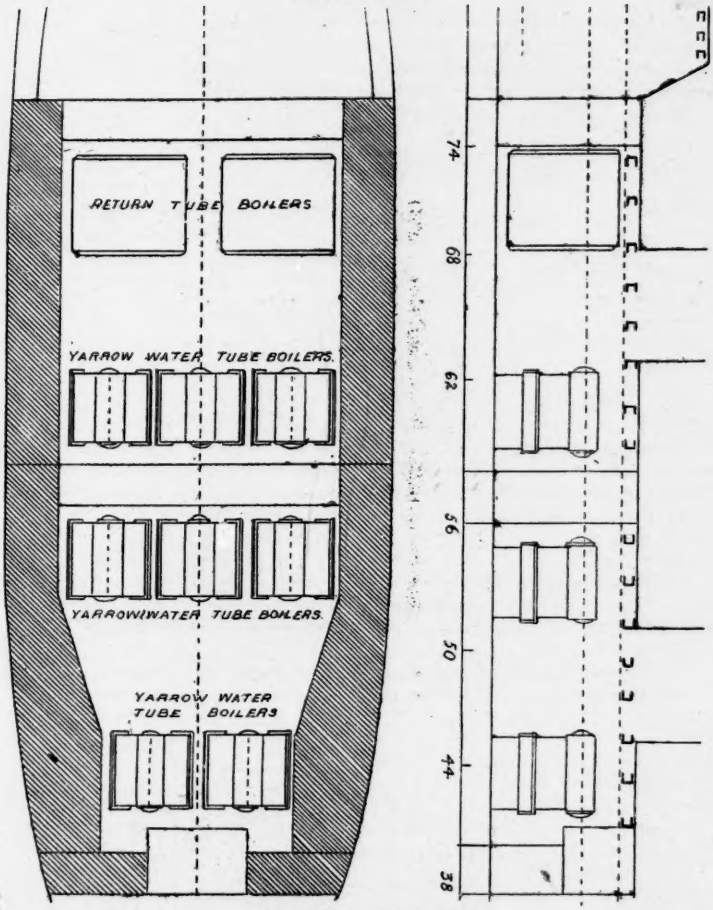
and one aft, protected by 10-inch nickel steel; four 15-centimetre (5·8-inch), six 12-pounder and eight 1·8-pounder Q.F. guns behind shields, with several machine guns and three torpedo-tubes, two of which are submerged on the beam and one in the stem above water. The ammunition tubes for the 9·4-inch guns will be protected by 7-inch nickel steel. The normal coal stowage will be 680 tons, with a draught of water of 18 feet. Her triple-expansion engines are to give a speed of 16 knots on a four hours' trial; steam being supplied by Yarrow water-tube boilers.

The new protected cruisers "Holland," "Friesland," and "Zeeland," which are fitted with two cylindrical and eight Yarrow water-tube boilers, have now all completed their steam trials, and the following results have been obtained :—

—	Speed in knots.	Number of revolutions.	I.H.P.	Air pressure in millimetres.	Coal consumption per I.H.P. per hour.	Length of trial in hours.	Remarks.
With Three Yarrow Boilers.							
"Holland"	9·973	70·04	1216	—	—	4	
"Friesland"	10·423	71·6	1077	—	—	4	
"Zeeland"	10·24	64·2	1162	—	—	4	
With Four Yarrow Boilers.							
"Holland"	11·63	80·51	1778	—	—	6	
"Friesland"	12·528	87·25	2006	—	0·828	6	
"Zeeland"	12·4	78·6	2062	—	—	6	
With all Boilers.							
"Holland"	16·92	123	6·236	10·15		4	Consumption of coal for auxiliary engines included.
	19·618	145·86	10·548	20·3 bis 50·8	1·026	4	
	Maximum	149·6	11·712				
"Friesland"	17·275	124·2	5·982	10·15	0·73	4	Consumption of coal for auxiliary engines not considered.
	19·87	147·27	10·416	20·3 bis 40·6	0·75	4	
	Maximum	148·3	10·850				
"Zeeland"	19·47	138·58	9·818	30·47 bis 50·8	0·927	4	Consumption of coal for auxiliary engines included.
	Maximum	141·5	10·589				
	16·466	114·22	5·203	10·15	0·945	4	

The different types of boilers in these ships have been so fitted, with the view of the stokers being gradually trained to work the water-tube boilers The three new ships of the same type, but slightly larger, viz., the "Utrecht," "Gelderland," and "Noord-Brabant," at present under construction, will be fitted with twelve Yarrow water-tube boilers.—*Mittheilungen aus dem Gebiete des Seewesens* nach *Marineblad*.

The accompanying sketch shows the arrangement of the boilers.



UNITED STATES.—*Gun Preponderance at Santiago Bay.*—Lieutenant B. W. Wells, Jun., flag secretary for Commodore Schley, has made an interesting and valuable comparison of the weight of fire in the two fleets which met outside of Santiago Bay, July 3rd. As the result, Lieutenant Wells draws these conclusions. The victory was due in part to the following causes:—

1. The greater accuracy of fire of the United States vessels.
2. The use of wood in Spanish ships.
3. The greater number of guns of 8-inch calibre on the United States ships.
4. The better morale due to the fact that all the crews had been under fire.
5. The value of a large secondary battery was demonstrated, for the work of the 6-pounders contributed largely in keeping down the enemy's fire by driving them from their guns.
6. The necessity for more and better protection for the gun's crews. With the men disabled or driven from their stations, the ship is of little value as a fighting machine. The armour of the "Colon" kept out 5-inch shells at a range of about 3,000 yards. This would be a very great superiority in many cases.

7. The small danger of injury to the water-line portions of the ships. So far as is known, no vessel was penetrated between wind and water. Moderate armour protection at the water-line, with a strong protective deck, would permit more efficient distribution of the armour around the gun positions.

A comparison of the batteries shows the following :—

United States.		Spanish.	
13-inch	8	11-inch	6
12-inch	6	6-inch rapid-fire guns	10
8-inch	32	5·5-inch rapid-fire guns	30
6-inch	14	4·7-inch rapid-fire guns	6
5-inch rapid-fire guns	12	12-pounders	4
4-inch rapid-fire guns	6	6-pounders	38
6-pounders	90	1-pounders	10
1-pounders	28	Maxim-Nordenfeldt	4
Maxim-Nordenfeldt	3	H. R. G. 37-millimetre	24
Machine	26	Machine	14
Total	225	Total	146

(H. R. G. refers to the Hontoria rapid-fire guns.)

From the foregoing table it will be observed that the United States vessels were superior in guns of large calibre, having a total of fourteen 13-inch and 12-inch, against the six 11-inch guns of the enemy. But it might be well to state here that the heavy guns did not get home except in the case of two shots, 12 and 13-inch, which struck the "Teresa," and perhaps one which struck one of the destroyers.

On the other hand, the superiority of rapid-fire guns of medium calibre was in favour of the Spanish ships, they having 50 guns, from 6-inch rapid-fire down to and including their 12-pounders, while the United States vessels had but 18 guns of the rapid-fire type.

In the smaller guns the proportions were 131 for the United States and 76 for the Spanish ships, omitting machine guns. This superiority in number proved an important factor in the battle, for it was stated by the Spanish officers that the 6-pounder fire was so accurately destructive that difficulty was experienced in keeping the men at their guns.

In this connection, however, the thirty-two 8-inch guns of the American vessels must be most seriously taken into account. They easily proved their excellence over other guns by the terrible execution which they wrought, and which undoubtedly contributed in a very marked degree to the final result.

In making this comparison it must be remembered that immediately on coming out of the harbour the Spanish vessels headed to the westward, bringing their full port batteries to bear, while the United States vessels were closing in, bows on. All the United States vessels were handicapped in varying degrees in this regard at the beginning of the battle. The following table is believed to be a fair estimate of the number of guns engaged on each side :—

United States.		Spanish.	
13-inch	4	11-inch	6
12-inch	4	6-inch rapid-fire guns	5
8-inch	18	5·5-inch rapid-fire guns	15
6-inch	7	4·7-inch rapid-fire guns	3
5-inch rapid-fire guns	6	12-pounders	4
4-inch rapid-fire guns	3	6-pounders	21
6-pounders	47	1-pounders	5
3-pounders	4	H. R. G. 37-millimetre	21
1-pounders	4	Maxim-Nordenfeldt	4
Machine	8	Machine	7
Total	105	Total	91

The "Vixen" is not included.

To determine this quantity of metal thrown take the time allowed from fire to fire for the 13-inch gun as a unit. Then in that length of time the weight of metal from each 13-inch gun would be 1,100 lbs.; from 4 guns, 4,400 lbs. The allowed time from fire to fire for the 13-inch is 320 seconds, and for the 12-inch it is 300 seconds, hence the weight of metal thrown by the 12-inch in 320 seconds is 3,613 lbs. These quantities for other calibres are found similarly. Hence we have for the American guns:—

13-inch	4,400
12-inch	3,613
8-inch	12,000
6-inch	1,778
5-inch rapid-fire guns	3,840
4-inch rapid-fire guns	1,584
6-pounders	7,520
3-pounders	384
1-pounders	720

Total weight thrown in 320 seconds, 35,839 lbs.

Total weight thrown per minute, 6,720 lbs.

In determining this quantity for the Spanish guns, the same time allowances are used. The weights of projectiles are for common shell. The time unit is 300 seconds, being the interval from fire to fire of the United States 12-inch gun.

11-inch	3,516
6-inch rapid-fire guns	3,750
5·5-inch rapid-fire guns	10,277
12-pounders	800
4·7-inch rapid-fire guns	1,440
6-pounders	3,150
1-pounder and R. F. G.	900
Maxim-Nordenfeldt	300

Total weight thrown in 300 seconds, 24,133 lbs.

Total weight thrown per minute, 4,827 lbs.

It will be noted that the weights thrown each per minute were as 6720:4827; this is approximately as 139:100. Therefore, the fire of the United States ships, instead of being treble that of the Spanish ships, was one-third greater, and this small difference could not alone account for the disparity in results.

The Government of the United States is just now engaged in re-designing guns of all calibres, from 4-inch up to 13-inch, with a view to increasing their power. The idea is to keep in the front rank of nations, a position which we have held for some years past. Every gun is to be made with greater length of bore and greater chamber capacity—that is, powder capacity. This change is a natural development, and while not due primarily to the present war, is one of the consequences of it. All the big guns built hereafter will be designed to admit of higher pressures than heretofore, in order to attain higher velocities. This change means that a 6-inch gun becomes almost as good as an 8-inch gun. In other words, a 100-lb. projectile which ordinarily was given a velocity of 2,000 feet, will now travel at the rate of 3,000 feet a second, thus increasing the energy of the gun fully a third. The velocity of all projectiles fired by the latest design of guns will be increased very much. Recent tests made by the Government at the proving ground developed the fact that a 100-lb. projectile fired from a 40 calibre 6-inch gun with smokeless powder obtained a velocity of 2,600 feet per second. A mere change of powder brought about this result, as the old gun only could send a shot at the rate of 2,200. The Bureau of Ordnance of the Navy Department hopes to break even these records in the near future. The significance of these changes in the velocity of projectiles will be all the more

apparent when it is stated that one of the big 13-inch guns will carry full fifteen miles its half-ton of energised destruction. The point to bear in mind is that the change, or improvement, in the guns is not so much in carrying quality as in the development of crushing energy. It will be next to impossible for any armour or fort to stand the shock of one of these batteries of big guns at close range. Of course ships cannot fire as far as forts. Seventeen degrees is about the maximum elevation that a gun is given on board a battle-ship. A turret would have to be cut to pieces to get any greater elevation.—*Army and Navy Journal.*

MILITARY NOTES.

PRINCIPAL APPOINTMENTS AND PROMOTIONS DURING SEPTEMBER, 1898.

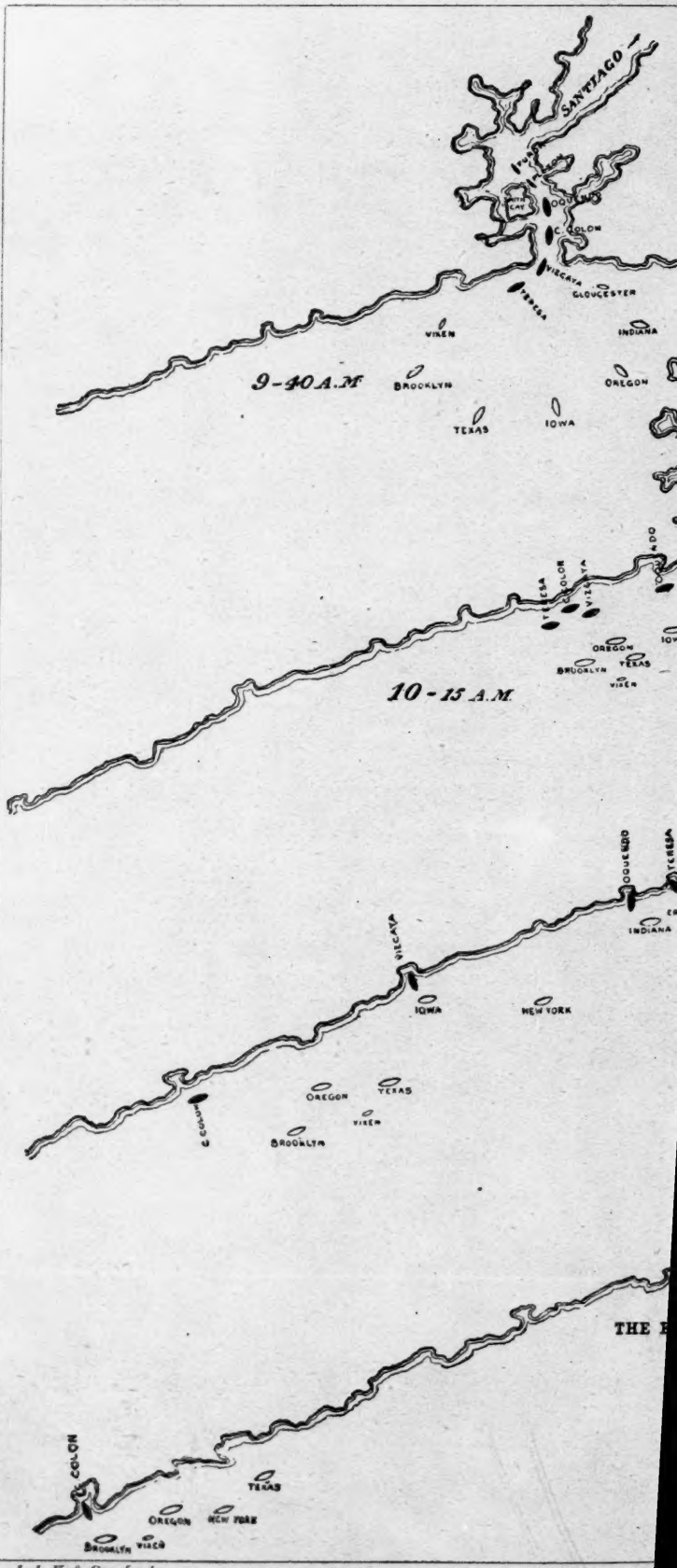
Major-General T. Fraser, C.B., C.M.G., R.E., *p.s.c.*, to command the Thames District, in addition to his duties as Commandant of the School of Military Engineering. Lieut.-Colonel Sir H. McCallum, R.E., K.C.M.G., to be Governor of Newfoundland. Colonels C. P. Egerton, h.p., to command the 39th Regimental District; C. H. Shepherd, D.S.O., to command the 9th Regimental District; C. G. Brind, to command the 34th Regimental District; D. T. Kinder, h.p., to command the 11th Regimental District; and H. B. Le Mottée, h.p., to command the 33rd Regimental District; and Lieut.-Colonel R. T. E. Dowse, 1st Bn. Suffolk Regiment, to command the 12th Regimental District. Surgeon-General J. Cleghorn, M.D., C.S.I., Director-General Indian Medical Service, to be Hon. Surgeon to the Queen.

HOME.—The following is the General Idea under which the recent manœuvres in Wiltshire were conducted :—

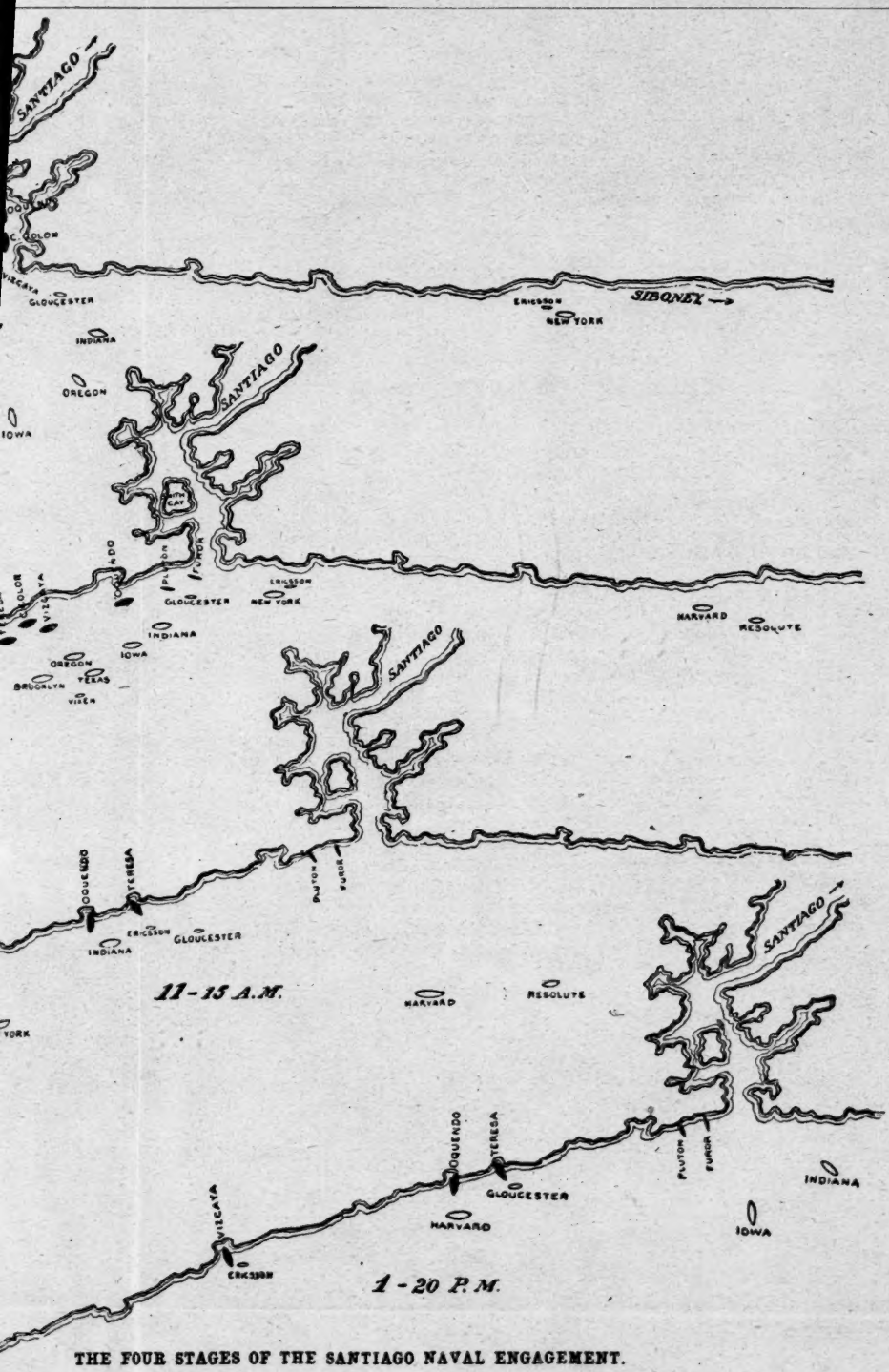
An invading force (Blue) has landed between Weymouth and St. Alban's Head, to co-operate in an advance on London with another force (imaginary), which is disembarking on the southern shore of the Bristol Channel—60 miles distant.

The rolling stock of the railway having been withdrawn, the Blue force is unable to use the railways, and they are available for the Red force only for the purpose of supply. (The Red force is the Northern Army.)

On the night of the 31st August the Red advanced force assembled about Salisbury was encamped in the following localities :—The Red army headquarters, and 2nd and 3rd Divisions, Homington; 1st Division, Wilton; Corps Troops, Ford Camp, near Old Sarum; Cavalry Brigade, Bower Chalke. In accordance with the instructions contained in the Special Idea, the Red army moved from these camps towards Shaftesbury, in three columns, and halted about Fovant without interruption from the enemy. The cavalry brigade covered the movement; it was directed at first upon Minchington Down, with two contact squadrons detached. One of these was directed on the left flank to reconnoitre between Tollard Royal and Pembridge, and to the south-west. The other was sent out on the right flank to reconnoitre the country between Melbury Abbas and Tollard Royal, and thence to the south-west. Three officers' patrols were also sent out. At 10.10 a.m., a report having been received that a hostile cavalry brigade was moving from the direction of Blandford towards Thorney Down, the commander of the Red cavalry brigade led it to Handley. It remained on Handley Hill in readiness to act for a considerable time, without receiving further information of the Blue cavalry. At 1.30 p.m. the Red brigade moved to Oakley, and found Blue cavalry and a battery behind Launceston Down. The mounted infantry opened fire against them from Thick Thorn Down, followed at 2.55 by the horse artillery battery. The Blue battery replied, and Red cavalry failing to draw the



J. J. K. & Co., London.



THE FOUR STAGES OF THE SANTIAGO NAVAL ENGAGEMENT.

Reproduced from Scientific American.

opposing cavalry on, its commander shortly afterwards withdrew it. The two batteries of horse artillery belonging to the Corps Troops were directed by the commander Red force on East Chase Farm as a support to the cavalry.

The orders issued to the commander of the Blue cavalry brigade induced its first dispositions. He was ordered to occupy, at 10 a.m., point 316, Tarrant Hinton Down, and to send officers' patrols towards Salisbury, and through all the avenues and passages of Cranborne Chase. Full information was also required of all the approaches to and exits from Stubhampton Bottom, and of any force between the brigade and Salisbury. The following were the dispositions:—Main body at the 17th mile-stone on the Salisbury-Blandford road; one squadron at the 15th mile-stone on the same road, with scouts thrown out towards Salisbury, and to cover the right of the brigade; one squadron at Tarrant Gunville with patrols to its front, and to communicate by level (214) with the Corps Cavalry. Officers' patrols covered the front from Cranborne on the right to Shaftesbury on the left. The Corps Cavalry Regiment marched by the Melbury Abbas road on Melbury Down—Hold Hill Farm—to secure the advance of the brigade. Subject to this, parties were to be sent to Melbury Down, Win Green, Ashmore, Tollard Royal, and Tarrant Hinton, and knowledge was to be obtained of the passages through Cranborne Forest. Contact was established by the Blue cavalry near Cashmoor with portions of the Red cavalry before 12 noon, after which hour desultory and minor actions took place between advanced parties only for some hours.

The umpires' remarks were as follows:—

The task of the Red cavalry was to cover the march of the army corps which was moving from Fovant towards Shaftesbury, to ascertain the strength and movements of the Blue force, and to endeavour to prevent him marching northwards. The commander of the Red cavalry kept his command concentrated and prepared to act, and he fulfilled the task assigned to him, so far as covering the march of the Red force was concerned. As regards information, the reports received by him from his advanced parties early in the day were inconclusive and wanting in accuracy. It would therefore have been better had he secured more certain information by pushing forward with greater vigour. The Blue cavalry was directed by the Special Idea to clear up the situation towards Salisbury. The commander of the advanced Blue army ordered it to obtain full information of any force between it and Salisbury. This information was not obtained, and the commander of the Blue army was left in ignorance of the fact that the Red army was that day on the march from Salisbury towards Shaftesbury.

Operations on Friday, 2nd September.

Special Idea, Home Army (Red).

On the afternoon of the 1st September the commander of the troops at Fovant receives the following instructions from the commander-in-chief of the British forces:—Whitchurch, 2 p.m., 1-9-'98. No. 2. Seize the high ground to-morrow about Charlton Down, and prevent the enemy advancing on Salisbury. Information has been received that one division of the enemy has disembarked in the Bristol Channel, and that the disembarkation of a further force is proceeding. —(Signed) X. Y., Chief Staff Officer.

N.B.—No one of the mounted troops is to be south-east and west of a line through Melbury Abbas and Martin, and no one of the infantry is to be south of an east and west line through Shaftesbury, Berwick St. John, before 9 a.m.

Special Idea, Invading Army (Blue).

On the afternoon of the 1st September the commander of the advanced force (Blue army) receives at Blandford the following instructions from the commander of the main army:—No. 2. Dorchester, 2 p.m., 1st September. Seize the high ground about Charlton Down to-morrow. If unable to do so, hold the enemy there with a view to prevent him interfering with the advance of the main army

(imaginary) on Shaftesbury. The main army will move to Blandford to-morrow. Information has been received that the disembarkation of the force (imaginary), one army corps, at Bristol, is proceeding without opposition.—(Signed) A. B., Chief Staff Officer.

N.B.—No one of the mounted troops is to be north of an east and west line through Compton Abbas and Tollard Royal, and no one of the infantry is to be north of an east and west line through Iwerne Minster and Chettle before 9 a.m.

The operations opened shortly after 9 o'clock, and lasted until 12.30 p.m. After the conference at the close it was notified that the director, after receiving the opinions of the umpires and the report of commanding officers, decided that the attack of the Blue forces was well carried out, but that when the "cease fire" sounded this force would have had to retire, owing to the great strength of the position held by the Red army.

Operations on Saturday, 3rd September.

Special Idea, Home Army (Red).

On the afternoon of the 2nd September the commander of the Red covering force receives the following despatch:—No. 3. Headquarters, Whitchurch, 4 p.m., 2-9-'98. Remain to-morrow in observation of the force with which you were in contact to-day. If attacked fall back on Fovant, so as to be in a position to co-operate with the main army, of which the advanced division (imaginary) should reach Salisbury to-morrow evening.—(Signed) X. Y., Chief Staff Officer.

N.B.—No one of the force is to be south of the Gillingham-Shaftesbury-Berwick St. John road before 10 a.m.

Special Idea, Invading Army (Blue).

On the afternoon of the 2nd September, 1898, the commander of the advanced force (Blue army) receives the following order from the commander of the main army:—No. 3. Blandford, 2 p.m., 2-9-'98. Advance to-morrow to the line East Knoyle-Hindon-Fonthill Bishop. If the enemy with whom you were in contact to-day is still near Shaftesbury drive him eastwards, so as to facilitate your junction with the Bristol force (imaginary). The main army (imaginary) will remain to-morrow at Blandford, and will cover your communications with that town.—(Signed) A. B., Chief Staff Officer.

N.B.—No one of the force is to be north of the line East Stour-Melbury Abbas-Tollard Royal before 10 a.m.

Operations commenced at 10 a.m., and the "cease fire" sounded at 1 p.m. The following remarks were issued at the close of the conference of umpires:—The operations carried out presupposed on the part of Red a situation in readiness to act a few miles east of Shaftesbury. The Blue force having advanced north to Shaftesbury, covered by a flanking position on its right, changed its direction eastwards. The Red force did not await its attack, but retired on Fovant, covered by a force on Whitesheaf Hill.

Operations on Monday, 5th September.

Special Idea, Home Army (Red).

At 4 p.m., 4th September, 1898, the commander of the Red covering force receives the following despatch from the commander-in-chief of the British forces:—No. 4. Headquarters, Andover, Red main army, 2.30 p.m., 4-9-'98. Information regarding enemy is to the following effect. His main advance (imaginary) appears to be by Farnham and Cranborne on Salisbury. I propose to hold him on the river Ebble with the force (imaginary) under my immediate command. The force (imaginary) which landed at Bristol occupied Bath to-day. If the enemy, with whom you were in observation yesterday, advances on Salisbury, I can deal with him, but it is important to prevent a junction between him and the hostile force (imaginary) at Bath. To prevent such a junction move to a position so as to be in readiness to act about Codford, and deny to the enemy the

line of the river Wylye. If you sight him while you are on the line of march towards the river, attack and drive him back in a westerly direction.—(Signed) X. Y., Chief Staff Officer.

N.B.—No one of the force is to be to the north of the Chilmark-Teffont Magna-Baverstock road, or west of a north and south line through Chilmark-Ansty before 8.30 a.m., at which hour operations may commence.

Special Idea, Invading Army (Blue).

On the afternoon of the 4th September the commander of the advanced force (Blue army) receives the following instructions from the commander of the main army:—No. 4. Blandford, 2 p.m., 4-9-'98. The main army will move from here to-morrow direct on Salisbury. The army corps (imaginary) which landed at Bristol is in occupation at Bath, and moves to-morrow on Devizes. Information has been received that the force with which you were in observation yesterday will move to-morrow on Wylye and Codford in order to interpose between you and Devizes. Attack him while on the line of march before he can get to the river Wylye, and prevent him reaching that river.—(Signed) A. B., Chief Staff Officer.

N.B.—No one of the force is to be north of the Chilmark-Fonthill Bishop-Hindon road, or east of a north and south line through Chilmark-Ansty before 8.30 a.m., at which hour operations may commence.

The "cease fire" sounded at 11.30, and the official remarks on the operations were as follows:—The problem to be solved by the Red force was, looking at the situation of the two armies, easier of execution than that allotted to the Blue force. Red succeeded in securing its hold on the river Wylye early in the day. The attack directed against Red through Great Ridge Wood was well conceived and executed. But it was met by superior forces already in position east of that wood, and the result would probably have been an indecisive battle.

OPERATIONS ON TUESDAY, 6TH SEPTEMBER.

Special Idea, Home Army (Red).

The situation of the Red covering force on the night of the 5th September was as fixed at the conference on that day. On the evening of the 5th September the commander of the covering force received the following telegram:—No. 5. Headquarters, Red army, Grateley, 4 p.m., 5-9-'98. It is intended to occupy with the main army (imaginary) a fighting position immediately east of the river Avon, situated approximately between Beacon Hill and Laverstock. To secure it being prepared and occupied without interruption, take up to-morrow, with a portion of your force, a rear-guard position for observation towards the west, between Yarnbury Castle and the river Wylye. The main body of your force should be disposed so as to be able to secure the retirement of the rear guard, and to delay the enemy moving on the high ground east of the stream that runs south by Winterbourne Stoke and Berwick St. James. Watch your right flank carefully, as the enemy (imaginary), who landed near Bristol, has occupied Devizes.—(Signed) X. Y., Chief Staff Officer.

N.B.—The dispositions are to be completed by 8.30 a.m., before which hour no one of the force is to be west of a north-and-south line between Oram's Grave and Fisherton de la Mere.

Special Idea, Invading Army (Blue).

The situation on the night of the 5th September is as settled at the conference on that day. The commander of the Blue detached force (Blue army) receives at 5 p.m., the following despatch:—No. 5. Headquarters, Blue army, Cranbourne, 2 p.m., 5-9-'98. The main army (imaginary) will march to-morrow to the line of the river Ebble. The army corps (imaginary) which landed at Bristol should reach Devizes to-day. It has been directed to march to-morrow and effect a

junction with your force at Maddington. Advance eastwards to-morrow and seize the line of the stream running south through Winterbourne Stoke and Berwick St. James with a view to bivouac near it.—(Signed) A. B., Chief Staff Officer.

N.B.—No one of the force is to be east of a line drawn through Chitterne All Saints-Stockton before 8.30 a.m.

The operations opened at 8.30 a.m. and finished about 11.30. The decision of the umpires was as follows:—The commander of the Red force, in accordance with the Special Idea, placed his rear guard, composed of one infantry brigade and one brigade division field artillery on the Yarnbury Castle ridge, sending his cavalry forward to the north. The main Red force held a well-selected position on the Stonehenge ridge. The Blue force deployed and carried the rear-guard position, which was believed to be the main Red position. This occupied a considerable time, and, as the Blue troops had already marched a considerable distance, the operations terminated without the attack on the main Red position being carried out.

Operations on Wednesday, 7th September.

Special Idea, Home Army (Red).

At 4 p.m., the 6th September, 1898, the commander of the Red covering force receives the following despatch from the commander-in-chief of the British army:—Headquarters, Salisbury, 2.30 p.m., 6-9-'98. No. 6. Our second army is approaching Swindon, and its advance will be felt in the next twenty-four hours on the left of your adversary. Force the passage of the river Avon to-morrow between Amesbury Workhouse and Old Sarum. Attack the enemy vigorously and push him back to the westward of the Salisbury-Winterbourne Stoke Grange road.—(Signed) X. Y., Chief Staff Officer.

N.B.—No one of the force is to be west of the Salisbury—high post—No. 5 mile-stone, Amesbury road, thence to Stockport, point 409 ditch, Tanner's Down, before 9 a.m.

Special Idea, Invading Army (Blue).

The detached force (Blue army) bivouacs on the night of the 6th September near the line of the stream running south through Winterbourne, Stoke, and Berwick St. James. Its commander receives, on the evening of the 6th September, the following instructions from the commander of the main army (imaginary):—Broad Chalke, 2.30 p.m., 6-9-'98. No. 6. Information has been received that another Red army (imaginary) is advancing southwards towards Swindon. Hold the passage of the river Avon to-morrow between Amesbury Workhouse and Old Sarum, and prevent the enemy with whom you were engaged yesterday crossing the river. Your left flank will be safe till nightfall.—(Signed) A. B., Chief Staff Officer.

N.B.—No one of the force is to be east of a north and south line through Stonehenge and the twentieth mile-stone on the Devizes-Longbarrow cross roads-Salisbury road before 9 a.m.

The "cease fire" sounded a few minutes before noon, and the decision of the umpires was as follows:—

As regards to-day's operations the task assigned to the Blue army was one of great difficulty. The Blue commander had to guard a river front of about six miles (the river fordable in many places) over a difficult country, in which the east bank, occupied by the Red army, dominated the west bank. There was some slight misunderstanding as to the Special Idea, the Blue commander thinking that the Red army could not use any road north of Amesbury Workhouse, while the Red commander considered that, having crossed the river, he was free to pass anywhere that he wished. In the result the commander-in-chief was of opinion that the Red commander crossed the river, but could not have advanced until his corps artillery had advanced closer to his support.

The Commander-in-Chief has called for returns to be sent in to the War Office from all officers commanding units in the recent manœuvres, stating strength of the units by ranks, showing those present at the manœuvres, and those not taken thereto, as of less than six months' service, or of over six months' service, but unfit from other causes; report on the physical condition generally of the men who took part in the manœuvres, and on the manner in which they bore fatigue, special reference being made to the young soldiers; the number of men who went into hospital from heat, fatigue, or other causes; an opinion as to the quantity and quality of the provisions, and as to the regularity of supply; an opinion as to the sufficiency and efficiency of the transport employed, both public and hired.

The friends of the late General Sir George Chesney, Royal Engineers, will be glad to know that in addition to a special memorial at Cooper's Hill, and a portrait of Sir George which was presented to Lady Chesney, arrangements have now been made for a suitable commemoration of his distinguished and varied services. The balance which remains over from the £370, which was subscribed by his brother officers and friends for the general memorial, has been placed at the disposal of the Council of the Royal United Service Institution, who have assented to arrange for a medal, in memory of Sir George, to be presented from time to time for some very valuable contribution to military science or literature.

The appointment of General the Rt. Hon. Sir Redvers H. Buller to command the troops in the Aldershot District makes the tenth since the district was first created in 1855.

It is commonly supposed that Aldershot, the most important military district in Great Britain, owes its origin to the war of 1854 with Russia. This, however, is not the case. It was the satisfactory result of the camp formed at Chobham in 1853 that led to the purchase of the land at Aldershot; and to his late Royal Highness the Prince Consort the nation is deeply indebted for having suggested its establishment. His Royal Highness was struck by the fact that although the principal foreign European nations annually assembled large bodies of troops in the autumn for the purpose of practising military manœuvres, nothing of the kind had, up to that time, ever been attempted in England. It was either late in 1852 or early in 1853 that the Prince Consort proposed to Lord Hardinge the formation of a training camp, and the idea was eagerly adopted, and energetically carried out. The first officer appointed to the command was the late General Sir William Knollys in May, 1855. On the 10th July of that year the Queen held the first review, at which were present one brigade of Foot Guards and seven fine regiments of Militia, some 6,000 men. The total occupation of the camp on the 10th February, 1856, was 14,592, of which 4,030 were Regulars, 10,040 Militia, and 522 British-German Legion. Since 1855 the command of the district, formerly known as the Aldershot Division, has been held by the following distinguished officers:—

Lieut.-General Sir W. T. Knollys	1855-60.
Lieut.-General Sir J. L. Pennefather	1860-65.
Lieut.-General Sir J. Y. Scarlett	1865-70.
Lieut.-General Sir J. Hope Grant.	1870-75.
General Sir T. M. Steele	1875-80.
General Sir D. Lysons	1880-83.
Lieut.-General Sir A. Alison	1883-85.
Lieut.-General D. Anderson	1885.
Lieut.-General Sir A. Alison	1885-89.
Lieut.-General Sir H. E. Wood	1889-93.
Lieut.-General H.R.H. the Duke of Connaught ...	1893-98.
General the Rt. Hon. Sir R. H. Buller	1898.

The Sirdar, after his victory over the Khalifa and the capture of Omdurman and Khartum, and acting in pursuance of instructions, proceeded on the 10th September to Fashoda, in consequence of the receipt of news that a French force was in occupation of the town. Five steamers constituted the little expedition—the "Dal" carrying the Sirdar and his staff, the "Nasr" with the 11th (Sudanese) Bn. Egyptian Army, the "Fatah" with 100 men of the 1st Bn. Cameron Highlanders and the 13th (Sudanese) Bn., the "Abu-Klea" carrying the rations, and the "Sultan" acting as guard-ship.

On the 15th September, the Sirdar's flotilla came in contact with the Dervish steamer "Safieh" and eleven large nuggers at Rungh, 310 miles south of Khartum. They were waiting reinforcements from the Khalifa in order to again attack Fashoda. After some resistance the "Safieh" was disabled, and the remainder captured.

At the town of Demzeki, 330 miles south of Khartum, the Sirdar encountered a further Dervish force. The enemy kept up a smart fire not only from the shore, but also from the reeds in which they were enabled to shelter themselves. After a bombardment by the Egyptian gun-boats, the 11th Sudanese were ordered to land and dislodge the enemy's marksmen. Led by British officers, the Sudanese threw themselves into the water, and waded breast-high through water and marsh to the shore, when the Dervishes surrendered.

On arrival on the 18th at Fashoda the Sirdar found M. Marchand with eight other French officers, and 120 Senegalese troops. On the following day he landed, hoisted the Egyptian flag about 500 yards south of the French flag, on a ruined bastion of the old Egyptian fortifications, commanding the only road which leads into the interior from the French position. After handing in a written protest on the part of the Governments of Great Britain and Egypt against any occupation of any part of the Nile Valley by France as an infringement of the rights of those Governments, the Sirdar left Fashoda for Sobat. He left a garrison of one Sudanese battalion, four guns, and a gun-boat, under Major H. W. Jackson, Gordon Highlanders, attached to the Egyptian Army, who was appointed commandant of the district. At Sobat a post was established and the Egyptian flag hoisted on the 20th September. The Sirdar arrived at Omdurman on the 25th September.

Army Order 139 lays down that (*a*) The subject of the 2nd paper in military history for the Staff College entrance examination will be a campaign, or portion of a campaign, that has taken place within the last 100 years (instead of 50 years).

The regulations respecting the Staff College will be amended accordingly.

(*b*) At the examination for entrance to the Staff College to be held in August, 1899, the subject of the 2nd paper in military history will be—The Peninsular War, 1813, from the beginning of the year to the assault on San Sebastian, 24th and 25th July.

The campaign of Vittoria must be known in detail. A general knowledge of the other events in the period will suffice. A map for the campaign of Vittoria will be issued to the candidates at the examination.

Napier's History of the Peninsular War (Chandos Classics) is recommended for study.

The Infantry of the three army corps for active service have, after recent changes, been constituted as follows:—

1st Army Corps.—3rd Grenadier Guards, 1st, 2nd, and 3rd Coldstream Guards, and 1st and 2nd Scots Guards, in London, Windsor, and Gravesend; 2nd Queen's, 2nd Devonshire, 2nd Somersetshire Light Infantry, 2nd West Yorkshire, 1st Lancashire Fusiliers, 2nd Scottish Rifles, 2nd East Surrey, 1st Royal Sussex, 1st Welsh, 2nd Black Watch, 2nd North Lancashire, 2nd Northamptonshire, 1st Durham Light Infantry, and 1st Royal Dublin Fusiliers at

Aldershot; 2nd Cameron Highlanders at Fort George; 1st East Lancashire and 2nd Shropshire Light Infantry at Portsmouth, and 1st Battalion Rifle Brigade at Parkhurst.

2nd Army Corps.—The 2nd Bedfordshire, 1st Connaught Rangers, 2nd Cheshire, 1st Royal Inniskilling Fusiliers, 2nd Hampshire, 1st Argyll and Sutherland Highlanders, 1st Royal Irish, 1st King's Own Scottish Borderers, 3rd and 4th King's Royal Rifles, 2nd Leicestershire, 1st Royal Munster Fusiliers, 2nd Norfolk, 1st Oxfordshire Light Infantry, 2nd Royal Fusiliers, 1st South Staffordshire, 1st Yorkshire Light Infantry, 2nd East Yorkshire, and 4th Battalion Rifle Rifle Brigade, all in Ireland; 2nd Royal Warwickshire, and 1st Royal Irish Fusiliers, at Colchester; and the 2nd Royal West Kent at Chatham.

3rd Army Corps.—The 3rd Royal Fusiliers, 2nd Seaforth Highlanders, and 2nd West Riding at Dover; 2nd (Duke of Cornwall's) Light Infantry and 1st Royal Welsh Fusiliers at Devonport; 2nd Liverpool and 2nd North Staffordshire at Belfast; 1st Essex at Warley; 1st South Lancashire at Preston; 1st Royal Scots at Glasgow; 1st Worcestershire at Plymouth; 1st York and Lancaster at York; 2nd East Kent at Brighton; 2nd Royal Lancaster at Lichfield; 2nd Lincolnshire at Sheffield; 2nd Middlesex at Woolwich; 2nd Northumberland Fusiliers at Portland; 2nd Royal Scots Fusiliers at Chatham; and 2nd South Wales Borderers at Pembroke Dock.

The following instructions will be observed as regards posting cavalry recruits to units:—"*Cavalry Regiments at Home.*—Recruits desirous of serving in cavalry regiments at home will be posted to the regiment in which they are desirous of serving, provided they fulfil the requirements of that regiment and the regiment is open to recruiting in the area in which the recruit enlists. Recruits should be warned as to their liability to be posted to other cavalry units of the same corps, but at the same time they should be given to understand that such postings will be exercised only when there are urgent and exceptional reasons. *Cavalry Regiments in India.*—Recruits desirous of serving in cavalry regiments in India will in the first instance be posted to the regiment at home which will provide the draft for the unit abroad, with a view to their being sent by the first opportunity to join the regiment in which they wish to serve. It should be clearly explained to every recruit on enlistment that he is liable to serve in any unit of the corps in which he enlists, but that, except under urgent or exceptional circumstances, he will be sent, when eligible, to the regiment abroad selected by him on enlistment. Recruits enlisting to serve with brothers in cavalry regiments in India will be similarly treated. *Cavalry Regiments in the Colonies.*—Regiments serving in the Colonies have depôts at home, and recruits for such regiments will be posted thereto."

In the geographical section of the British Association which sat at Bristol on the 14th September, Mr. E. S. Bruce read a paper on "The Use of Electric Balloon Signalling." In this he dealt with the system of electric balloon signalling invented by himself. The apparatus consists of a balloon, made of a translucent material and filled with hydrogen or coal gas, in which are placed several incandescent electric lamps in metallic circuit with a source of electricity on the ground or the deck of a ship. In the circuit on the deck is an apparatus for making and breaking contact rapidly, and thus, by varying the duration of the flashes of light in the balloon, it is possible to signal according to the Morse code. Mr. Bruce claimed that his electric balloon had been successfully manipulated not only in fair weather, but in half a gale, a snowstorm, and mist. Regarding the distance to which signals might be transmitted, he thought it reasonable to expect that, given a sufficient altitude, a high candle-power, and a clear atmosphere, through a telescope the flashes would be visible some 80 or even 100 miles. In

the discussion which followed it was suggested that a balloon might become unwieldy in a wind and that the kite would then become a valuable medium.

Mr. C. M. Clode, in his work on "Military and Martial Law," gives a description of the British Articles of War of 1629, but he also, in the same place, refers to his work on the "Military Forces of the Crown," in which the Articles of War of 1625 are mentioned, but none of 1629. In his book on military law the Articles of 1629 are referred to as being, in manuscript, in the Record Office. Being issued after those of Gustavus Adolphus, of 1621, and before those of the Earl of Arundel, of 1639, these Articles, whether of 1625 or 1629, were put forth at a most interesting period of the development of military law in England. After much search, made by Lieutenant J. C. Colwell, Naval Attaché of the United States Embassy in London, the Articles have been found in the Public Record Office of the British Museum, and comparison with Mr. Clode's description shows that they must have been the Articles which he had beforé him. Lieutenant Colwell writes in regard to them as follows:—

"I have made further enquiries regarding the Articles of War, copies of which were sent you, and find that when the fire occurred in 1834, partly burning the Archives of both the Lords and Commons, the papers that were saved were thrown into great confusion; a mass of these papers were subsequently re-arranged, and the Articles referred to were preserved in a volume of undated papers in the Public Record Office, and is in the 'State Papers,' Domestic, Charles I., Vol. 13, No. 41. When these papers were compiled, the document in question was put as being presumably of date 1625; the gentleman that made the searches, however, is inclined to the belief that it is more probably of date 1629, but no dated letter or paper could be found, and the date could not be fixed with any certainty."

The following is a copy of the Articles:—

"Martiall Lawes ordained and instituted by his Ma^tie w^th the advice of the Counsell of warr for the gouvernment and good ordering of the troopes in this Kingdome, either being in an Army or in Regiments, or in single Companies to punish the malitious and wicked, And to defende the innocent, according to the custome of all well gouverned Kingdomes.

Hee that blasphemeth, or is knowne to be a common swearer, to have his toung bored through w^th a hot Iron.

Hee that is knowne to be a drunckard, is first to bee admonished, And for the next to be put in prison, And to be kept there at bread And water seaven daies. And his meanes that while that is overplus, to be bestowed on some sick or poore Soldier.

That if anie Soldier be druncke on his garde, or on the day hee should exercise, if he be an Officer he is to be Casseered; if a Soldier, he is to be seaven daies at bread And water, as is before said. And if that doe no good, he to have the Strappadoe, either more or Lesse.

That if anie shall absent himself from the Church, to have the same punishment of bread And water.

That if anie Soldier or Officer doe abuse either man or woman, the party grieved shall goe to the Officer y^t Commands in Chief, Let him be Captaine or more then a Captaine, or Lieutenant or Ensigne, if none of these then to the next Justice of the peace, if the cause require, And desire him to have him forth coming, and to write to the Officer of the Offender, to let him knowe of the Offence, then that chief Officer must crave Justice of a Counsell of warr, according to the Offence, either to aske the partie forgivenesse, or to punish it w^th imprisonment or the Strappadoe, or w^th more or Lesse as the fault requireth.

If anie Soldier doe shed blood, or maime anie of his fellowes, or anie other that is no Soldier, hee must bee more or lesse punished till the party offended be satisfied according to the punishment before named, and at the direccon of the Officer, if there be no Marshall Court in that place, he must be brought where there is one.

If anie Soldier doe force anie woman or maide he is to suffer death.

If he steale anie thing that is of note hee is to suffer death, if of small value hee must be more or lesse punished, and imprisoned untill hee make satisfaccon, And to stande w^th^ a paper on his breast, where there shalbe written the Offence, and if it be done in a Market Towne, or nigh, then to have it on a Market day.

That if anie Soldier doe give anie hinderance to Market folkes passage, to be severely punished, but if they take anie thing from them, to be punished w^th^ death w^thout mercie.

That no Soldier be seene w^thout his sworde, And if hee will take no warning then to be put in prison.

That no Soldier be found a mile from his Garrison or Lodging w^thout leave of his Officer in wryting, upon paine of imprisonment.

If a Soldier have leave And doe not returne w^thin the tyme limited, w^thout some sufficient excuse, And then to bring some sufficient testimonie of it, he must be punished as before.

If anie Soldier doe sell anie parte of his Cloathes or Armes, to one another, or to anie other hee shall have the afore said punishment, and the party that doth receive it shall loose his money, for they are not his but his Ma^s^.

That if anie Officer of a Towne shall see a Soldier passe, w^thout asking him where his passe and forecaste is, And if the Soldier have no passe, then is hee to send him from Constable to Constable till he come to his Officer, If he doe not his dutie herein to his Maiestie, he must be presented to the Lords.

That anie Soldier that does strike his Officer, or anie other Officer, or doth but make shewe of it, as by laying his hande upon his sworde, or give him ill language, shall suffer death w^thout mercie.

That if anie Soldier doe use anie uncivile speeches either against his Maiesty or anie other person in authoritie or anie other waies, is to be punished w^thout mercie.

That no man shall goe of his garde w^thout leave of his chief Officer that there commandeth, w^thout due punishment, such as have bene fore named.

That no Sentinell be founde sleeping upon his garde upon paine of death.

All other disorders whatsoever, are to be punished, as these formerly mentioned, though not formerly nominated.

That all Soldiers And Officers doe take an Oth as the Custome is, in all Countries, to be faithfull to his Ma^ties^ service, both in thought worde and deede, and not to conceal anie thing that they shall heare or see, that is not for his Ma^ts^ service And honor, and to obey all Commandements.

That there be authoritie given to anie three or more of the Commissioners, to call a Marshall Courte, And sit in Comission, to heare, Judge, And determine anie fact done by Soldiers, but to have no power to put to death, till they have advertised the Generall, that shall have authoritie of Life and death, for such troupes as he shall commande.

To have in every Market place a Gibbet, And Strappadoe, for the sight of such a remembrancer, will doe good in a wicked mynde.

That there be a Provost appointed in every Regiment, when the Regiments shalbe full, and a prison ordained for Soldiers a parte from anie other.

The Provost must have a horse allowed him, And some Soldiers to attende him, And all the rest commanded to obey him, And assist him, otherwise the service will suffer, for hee is but one man, and must correct manie, And therefore cannot be beloved. And hee must be riding from one Garrison to another, to see that the Soldiers doe no outrage nor scath about in the Countrie.

And these Orders are helde in all Countries where true discipline is esteemed."

Since the establishment of the Imperial camp at Lokoja and Jebba on the Niger there have been three successful expeditions against native tribes. British troops, under Lieut.-Colonel J. Willocks, D.S.O., Leinster Regiment (Royal Canadians), have been up to Bargu, beyond Boussa. The 1st Bn. West African Frontier Force is nearly completed. This is under Lieut.-Colonel T. D. Pilcher, Northumberland Fusiliers. The 2nd Battalion is also in an advanced state under Lieut.-Colonel Fitzgerald, but several recruiting officers have been sent up the Benu river to raise men in that district. The men they are recruiting however are Houssas not Nupes. There has been a good deal of sickness in both camps, but the health is improving, owing probably to the erection of wooden houses at Lokoja and Jebba. The "Biafra" sailed from Sierra Leone on the 8th September, and on the day she left practically the first start was made in the renewal of operations against the rebels. This was the dispatch of G Company of the new West African regiment, consisting of 100 men with 300 carriers, who were taken up on the railway to Waterloo, and from there were going to Tiama. Another company of the same regiment was under orders to proceed in the same direction. The rains were still on and were very heavy. Up to the date of the steamer's departure the number of troops recruited by Colonel E. R. P. Woodgate, C.B., for the new West African regiment was 785.

On the 6th September a severe outbreak occurred amongst the Mahomedan population at Candia, in Crete. While Lieut.-Colonel F. M. Reid, 1st Bn. Highland Light Infantry, was taking over the *Dîme* office, according to orders, the picket was attacked, and he was cut off from the camp with a few Bluejackets, Royal Marine Light Infantry, and twenty men of his own battalion. With these he held out. He was afterwards reinforced by a party of the battalion driven from the telegraph barracks and a small party from H.M.S. "Hazard," and after four hours' fighting was relieved by the Turkish Governor, when he and his party embarked on H.M.S. "Hazard." The camp was also attacked. On the 8th reinforcements of French and Italian troops arrived.

The loss incurred by the British consisted of Lieutenant R. J. A. Haldane and 10 men (Highland Light Infantry) and 4 Bluejackets killed; Lieutenant T. H. M. Clarke and 1 man (Royal Army Medical Corps), 1 man Royal Engineers, 6 Bluejackets and 1 Marine, 2nd Lieutenant W. H. E. Segrave and 22 men Highland Light Infantry wounded.

Reports from East Africa state that Captain C. I. Fry, of the 4th Bombay Infantry (Rifles), with 350 men, made a night march from Helished to surprise the camp of the Ogadyn Somalis. A number of cattle were captured. On the return march the force was constantly molested by small parties of the enemy, 162 of whom were killed. Of this number 41 were accounted for by 40 men of the 1st Baluchis, who were charged by the enemy at close quarters. On August 18th another force went out, and captured a number of cattle, the Ogadyns taking to flight. On the 21st of August the Ogadyn chiefs came in and tendered their submission.

AUSTRIA-HUNGARY.—There are in numerous directions, for instance in Bohemia and adjoining lands, networks of excellent roads for cyclists. It is not necessary to enlarge on the various uses that a skilful commander might make of cyclists in war, but it is well known that they would often be the means of reducing to a minimum the expenditure both of time and strength. It should therefore be considered how cyclist sections can best be organised for rapid movement to any particular point, when wanted. Each infantry division should

have a cyclist section of about 200 men, and each cavalry division should have one of 400; or, to use current expressions, an infantry division should have one company, and a cavalry division two. From these companies detachments would be sent to the intelligence troops, and to the advanced cavalry; the remainder would be at the immediate disposal of the divisional commander. Single cyclists would be employed as orderlies. When roads are crowded by troops the cyclist companies must be placed where their services can be made available. There should be about ten tandems in each section, the man in front driving, and the one behind, who should be an officer or under-officer, signalling, or sending verbal messages by single men. When a cyclist section cannot protect its own flanks it ought to have two horsemen on each flank for the purpose. A marching company would appear in the following order:—In front, two tandems and two ordinary cycles, carrying two officers, two under-officers, and two men; at a distance of 600 paces, the company in such formation as the road will allow, the tandems leading; 200 paces in rear of the company the rear guard, composed of an under-officer and three men on a tandem and two ordinary cycles; the flanking parties generally mounted men, and the connection kept up by single cyclists as required. The men should carry as little as possible besides a carbine and a large quantity of ammunition; side-arms may very well be dispensed with, halt the company carrying spades instead, as they are likely to be often in a position which may be strengthened by earthworks. In battle their duties will be principally defensive. A company would send certain sections into the swarm line and the remainder would act as a reserve, according to the usual infantry tactics. The men in the fighting line should take their cycles with them unless the ground is too rough, in which case they can be left with the reserve. It is evident that the details of duty in a cyclist corps can never be fixed by regulations, although the general idea can. The ordering of details must always be left to the cyclist commander, on whose enterprise and intelligence the conduct and success of the company depend.

The whole of the Austro-Hungarian cavalry is to be armed with the carbine of 1895, which possesses decided technical and ballistic advantages over the pattern of 1890. The latter will be given over to troops on a peace footing, and to the reserves. The authorities have also ordered that the new carbine is to be served out to the field artillery. It is under construction in the Austrian and Hungarian factories, and its distribution will begin this year.—*Militär-Zeitung.*

The Emperor has decided on the creation of three new regiments of Cisleithan Landwehr. Two of them will belong to the Landwehr division of Lemberg, and the other to that of Josefstadt. This is the beginning of the projected re-organisation of the Cisleithan Landwehr, which contains fewer units than the Transleithan, although the population from which the latter is drawn is comparatively small. The regiments will now be equalised, and the number of battalions will be raised from 92 to 117.—*Revue du Cercle Militaire.*

FRANCE.—A ministerial decision has fixed the number of voluntary three years' engagements, taking place between the 1st October and the 31st December, 1898, as follows:—Infantry, Zouaves, Algerian rifles, Paris firemen, artillery, Alpine batteries of the 14th region, and the 2nd, 3rd, 5th, 6th, and 7th Regiments of Engineers—10; the 1st Regiment of Engineers—16; the 4th Regiment of Engineers—13; battalions of light infantry, of foot artillery, and group of Alpine batteries of the 15th region—6. Three years' engagements are also admitted, in number not specified, and in accordance with the requirements of the Service, for the 5th Company of the Remount Corps (the School of Saddlery at Saumur), and, in unlimited numbers, for the African light infantry battalions.

All mounted officers of Territorial Infantry, during their period of instruction, are to be supplied with horses for field duties on the same terms as the infantry officers of the Active Army, and the expenses which result are to be paid out of the credit granted for the manœuvres.—*Revue du Cercle Militaire.*

The following memorandum explains the object of the field-firing which preceded the manœuvres of the 3rd Corps:—To teach the troops to fire, during a manœuvre, under conditions as nearly as possible resembling the realities of war, and at the same time to improve the instruction of the officers in the control of fire; also to teach the different arms to combine their fire, and so secure their mutual cohesion and unity.—*Revue Militaire Suisse.*

The new Q.F. gun is loaded with extraordinary rapidity, owing to the re-distribution of the gun detachment, and the extremely simple duty assigned to each number. The gun recoils on its carriage, and returns to the firing position by means of a special brake, but the carriage itself does not move. Expert gunners can fire 15 rounds in a minute, which means, for a six-gun battery, 90 rounds in the minute, whereas the Bauge battery fires only 12 rounds in the minute, and the new German field-battery only 48. Its effect is amazing. Two kinds of projectiles are used, one filled with melinite, for destroying works, walls, etc., and the other containing 300 bullets and a bursting charge, to be employed against troops. The bullets from each shell spread over about five acres of land. The laying of the gun is much simplified, and consequently more rapid; but extra attention is also paid to cover, the gun being sunk to the lowest level compatible with efficient working, and the detachment being protected by shields. Batteries so placed, and firing smokeless powder, are difficult to discover, and the gunners cannot be seen at all from the front. An attack on them would therefore be a matter of great difficulty, but we must not be over-confident in our superior artillery. In 1870 neither the famous mitrailleuse nor the Chassepot helped us much, and we must not forget that the Germans are about to furnish each of their army corps with batteries of heavy guns, against which our quick-firers may be unable to prevail.—*Militär-Zeitung.*

GERMANY.—The new field-gun has a bore of smaller capacity than that of the old one, and therefore requires a powder that will burn more slowly. This powder is tubular, and has externally a resemblance to filite and cordite. The weight of the charge is ·58 kilogramme, while the weight of the former charge was ·64. The chamber of the projectile is rifled as in naval guns, and the trajectory in 2,000 metres reaches a height of 36 metres, as compared with 48 in the case of the old gun. It is said that all field batteries will be armed with the new gun before the end of this year.

The howitzer battery, which forms part of the heavy artillery attached to a field force, is composed of 6 howitzers, 10 wagons, a platform wagon, an observation wagon, 6 wagons for the transport of platforms, a forage wagon, a commissariat wagon, a forge, and a baggage wagon. The employment of these batteries will be limited to particular cases, such as the attack and defence of well-fortified positions. They are not to manœuvre. The howitzer cannot long be used without its platform; but, on the other hand, it takes a considerable time to lay down the platform properly; nor can a howitzer battery take up a position rapidly. In travelling the men sit on the different wagons. The howitzers are heavy enough without the additional weight of gunners. The above remarks apply with still greater force to mortars.—*Jahrbücher für die Deutsche Armee und Marine.*

ITALY.—After two months' training in Parma, a cyclist company started on the 31st May for a four days' journey in the Appenines. The company was

drawn from the Bersaglieri regiments, and consisted of 1 captain, 3 lieutenants, 1 medical officer, and 88 men, divided into three sections under the superintendence of a staff officer, and accompanied by fourteen attached officers. Some fighting exercises were performed on the way, and the folding cycles, with which one section was supplied, proved of much value. The steepest parts had to be done on foot. Altogether, a distance of about 200 kilometres was accomplished, in which the damage done was small and easily repaired. Not one man was left behind, although two-thirds of the company had never cycled before the commencement of their recent training.—*Militär-Zeitung.*

ROUMANIA.—The Roumanian soldier receives for breakfast either spirits, coffee, or tea. Some military doctors, however, believe that spirits at this meal should be abolished. The drinking of spirits has come to such a head among the agricultural population of Roumania that medical and judicial warnings are constantly heard on the subject, and it is said that the time has fully come for an energetic crusade against the evil. In 1894 a circular was issued by the Ministry of the Interior, in which it was said to be commonly known that the excessive use of spirituous drinks was constantly increasing; that a proportion of the inhabitants suffered from alcoholism, which in very many cases was the cause of sterility, mental disease, premature death, poverty, and crime. A high medical official reported, for the year 1892-93, that the number of mad-houses was no longer sufficient for the patients, and that the prevalence of disease was due to two causes—excess in the use of spirits and consumption of unsound maize, producing alcoholism and pellagra; that the drinking habits of the peasants not only ruin their health, demoralise them, and incite to crime, but render good housekeeping impossible; and that in many villages whole families drink, the craving being productive of frightful misery among the children. Another authority says that the vice of drunkenness has, as usual, been attended with the direst poverty in the country; it has destroyed morals, loosened the family tie, weakened body and mind, and increased crime to an incredible extent. These facts should lead to the final stoppage of spirits as a component of the soldier's breakfast. As a matter of fact, many soldiers take coffee instead of spirits at breakfast, and on leaving the Army continue this habit in their homes.—*Die Vedette.*

RUSSIA.—The general idea for the grand manœuvres of the St. Petersburg and Finland troops in the present year, was that the Northern Corps had arrived from Finland, taken the northern district of the St. Petersburg Government, and was about to take possession of Gatschina. The Southern Corps, on the march from the town of Luga by way of Gatschina to Viborg, halted at St. Petersburg to wait for expected reinforcements from Jamburg, and to ascertain the position of the enemy. The Grand-Duke Vladimir was in command of the manœuvres; Prince Obolenski, adjutant-general, commanded the Northern Corps; and Lieutenant-General Baron Meiendorf the Southern. Both sides had balloon sections, heliographs, telephones, and cyclists. A squadron of the fleet was also at the disposal of each. The transport and supply were carried out by the corps *intendance*, and the several regiments had charge of their own wagons, besides which there were, in the Northern Army, divisional trains, with 75 country wagons in each division. The Northern Army stood in two columns when hostilities commenced—the right consisting of 12 battalions, 8 squadrons, and 22 guns, and the left of 14 battalions, 6 squadrons, and 32 guns. The Southern Army, having received intelligence of the enemy, posted troops on the right bank of the Neva, its right advance guard consisting of 8½ battalions, 10 squadrons, and 16 guns, and its left of 10½ battalions, 12 squadrons, and 38 guns. The main body of the Southern Army was close to Krasnoé Selo, and its ships were concentrated at the mouth of the Neva. The ships of the Northern Army arrived from Kronstadt,

and drove those of the Southern Army up the river, assisting their own side to take possession of the mouth of the river and to drive back the enemy. The interest of the manœuvres was enhanced not only by the co-operation of the ships, but also by bridging work on a large scale.—*Die Vedette.*

Since the winter of 1894-95 the 35th Infantry Division has furnished detachments for distant hunting excursions in winter, such exercises being considered the best for preparing these troops to do their duty in war. It is now specially ordered that the number of the expeditions be increased. Each regiment must carry out at least two of them during the winter, and the distance is to be increased by degrees up to 600 kilometres. At the same time detachments are to manœuvre against each other, and to hunt wild animals on every opportunity, in order to cultivate circumspection, intelligence, and coolness. A series of experiments is also ordered for the purpose of ascertaining what is the best kind of clothing and foot-gear for the *chasseur*, the most convenient shelter the most suitable kind of snow-shoes, and the best kind of preserved provisions. During the past four years the hunting detachments have each made nine expeditions of from six to twenty days' duration. The longest marches, from 52 to 54 kilometres, were performed in fine weather; but against head-wind and in snowstorms the distance was reduced to about one-fourth. In addition to ordinary operations the men are taught to judge distance, to ascertain their whereabouts in a country, to make the best use of the materials within their reach, to throw up hasty defences in the snow, to sketch, cook, hunt, and do all the duties that would be required of such a corps in war. The moral and sanitary condition of the men was excellent, hardly any being sick; a careful medical examination was made on the day of the march out, and on the previous day. They had 400 grammes of meat, two hot meals daily, and tea twice a day.—*Deutsche Heeres-Zeitung.*

SWITZERLAND.—Every soldier who knows anything of the Swiss Army must acknowledge that it has made great progress in recent years—improvement being visible in all departments and branches of the Service. This is especially the case in the cavalry, which has learned much since Colonel Wilte was placed at its head. The development of this arm is still being carried on. The new orders on the mounting of cavalry officers have had an excellent effect. Hitherto the officers have not been obliged to do more than keep one horse which had been passed by the Commission on Military Horses and they have not been under any necessity to do so except when on duty. In future every newly-appointed officer is to receive a horse from the remount depôt for his own use, and to be kept at his own expense. After five years these horses are to be returned to the remount depôt to form a reserve for mounting the men, or fo doctors and officials, while the cavalry officers are supplied with fresh horses These regulations do not apply to the second or third horses which cavalry officers are obliged to keep during the continuance of their military duty. The Government will annually require about 60 officers' horses, at an average price of 2,200 francs, making an outlay of 132,000, which total will, however, be reduced to nearly 70,000 francs by the return of horses to the depôt, and by the cheaper production of young horses.—*Die Vedette.*

NAVAL AND MILITARY CALENDAR.

SEPTEMBER, 1898.

1st (Th.) Launch of first-class battle-ship "Iéna" at Brest.
2nd (F.) Decisive Victory of the Anglo-Egyptian Army over the Dervish Army under the Khalifa; capture of Omdurman and Khartum.
3rd (Sat.) Launch of torpedo-boat destroyer "Cynthia" from the yard of Messrs. Thornycroft.

6th (Tu.) Mahomedan outbreak in Candia, Crete; British soldiers attacked.
7th (W.) H.M.S. "Proserpine" commissioned at Chatham.
" " News reached Omdurman of the presence of a French force at Fashoda, south of Khartum.
8th (Th.) Conclusion of British Army Manœuvres.
" " Arrival of French and Italian reinforcements at Candia.
9th (F.) Defeat of the Sofas, West Africa, by French under Lieut. Woelfel.
10th (Sat.) Assassination of the Empress of Austria.
" " Sirdar left Omdurman for Fashoda.
11th (S.) Portion of 1st Bn. Border and 2nd Bn. Dorsetshire Regiment, and a battery of Royal Artillery arrived at Candia, Crete.
" " 2nd Bn. Royal Welsh Fusiliers left Cairo for Crete.
12th (M.) H.M.S. "Cossack" paid off at Chatham.
14th (W.) 1st Bn. West Riding Regiment and 23rd Co. Southern Division, Royal Artillery, arrived at Southampton in the "Jelunga."
" " 3rd Hussars left Southampton for India in the "Simla."
16th (F.) Conclusion of French Grand Manœuvres.
19th (M.) Sirdar hoisted Egyptian flag at Fashoda.
21st (W.) 1st Bn. Sherwood Foresters left Southampton for Malta in the "Jelunga."
22nd (Th.) Gedaref captured from the Dervishes by a force of Egyptian troops under Colonel C. S. B. Parsons, Royal Artillery.
" " Launch of second-class cruiser "Puglia" from Royal Dockyard at Taranto for Italian Navy.
25th (S.) Sirdar arrived at Omdurman from Fashoda.
" " 1st Bn. Grenadier Guards and 37th Field Battery Royal Artillery left Alexandria for England in the "Jelunga."
27th (Tu.) H.M.S. "Proserpine" left for North America and West Indian station.
28th (W.) Conclusion of Russian Army Manœuvres in the Crimea.
29th (Th.) 1st Bn. Sherwood Foresters arrived at Malta in the "Jelunga."
" " Launch of torpedo-boat destroyer "Orwell" from Messrs. Laird's yard at Birkenhead.
30th (F.) Publication in *London Gazette* of despatches of the Sirdar, dated 5th September, 1898.
" " Special Army Order issued on Victory of Khartum.

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NAVAL.

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NOTICES OF BOOKS.

General Sir Richard Meade and the Feudatory States of Central and Southern India. By THOMAS HENRY THORNTON, C.S.I., D.C.L. London: Longmans, Green and Co. 1898.

Mr. Thornton, whose "Life and Work of Colonel Sir Robert Sandeman" we praised so highly, has now produced another most excellent biography in his "Life of Sir Richard Meade," who for forty-three years served the Indian Government as soldier, political officer, and administrator. That the life of such a man is of the intensest interest goes without saying, for Meade was one of the foremost and best of a class of Government official that are perhaps, as a body, the best that serve our own or any other Government in the world. We refer to that body of officers, civil and military, which form the Political Department, and

through whom the Government of India conducts its relations with its own feudatory native states and the independent races on its frontier. Meade was born in 1821, and went out to India at the early age of seventeen, and so when the Mutiny broke out he had been some twenty years in the country—for him an uneventful period, and passed in the ordinary routine life of an officer serving either with a regiment of native infantry or in some staff employ. The Mutiny, however, was soon to change all that, and in the stirring time that followed its outbreak Meade rapidly came well to the front. The revolt of the Gwalior contingent, to which he was at the time attached as brigade major, left him without a post and available for any work that his superiors could find for him. And he had not long to wait, for he was at once selected as a suitable officer to raise a regiment of native cavalry, and Meade's Horse, as it was then called, still exists incorporated in one of the best of the smartest native cavalry corps in India, the Central India Horse. With this force Meade rendered splendid service during the Mutiny, the crowning act of his career being one of cool personal bravery, by which he saved Scindia's—the Maharajah had always remained loyal though his army had revolted—palace at Gwalior from destruction. "At great personal risk he entered the palace, full at the time of armed and excited soldiery, parleyed with the occupants, and induced them to surrender without firing a shot, thus saving many lives and much destruction of property and winning the lasting gratitude of the Marátha chief." His knowledge of natives, his influence with local chiefs, and his great personal popularity, were factors that caused him to be of great assistance in the pacification and restoring to order of the disturbed districts, and not the least notable act of his career was the capture and bringing to justice of Tanti Topi, the rebel leader, who was one of the Nana's chief agents in the perpetration of the Cawnpore massacres. As the poet of the barrack-room wrote:—

"Who caught Tantia Topee?
'Twas I,' said Pat Meade,
'By palaver and speed.
Who else did the deed?'"

In 1859 Meade first joined the Political Department, his appointment at first temporary but afterwards made *pucka*, being one for which he was peculiarly well fitted, that of Political Agent at Gwalior. His scope of influence was however soon to be very considerably enlarged, for two years later he was appointed Governor-General's Agent for the States of Central India. This was a post of the highest importance, for it brought under his control not only Gwalior and Indore, but also Bhopal and the Rajpoot States in Bundelkund and Rewah. Eight years of this administration brought him a well-earned C.S.I., for it must be remembered that he took them over disorganised and disrupted by the recent rebellion, and left them settled, prosperous, and revenue-producing, with the "Queen's peace over all." His next appointment was that of Chief Commissioner of Mysore and Coorg, but after three years' work he was called away to preside over the commission to inquire into the terribly maladministered affairs of Baroda, and was, in 1875, one of the judges appointed to try the Gaekwar on the charge of attempting to poison the British Resident, Colonel Phayre. His services in connection with Baroda earned him his step in the Order of the Star of India, and his special selection by Lord Northbrook for the highest post in the Indian Diplomatic Service, the office of Resident at Hyderabad. The magnificent work he did in that position until his retirement our readers will learn from Mr. Thornton's pages. Meade's career, in truth, is a magnificent sample of the "slow, unseen work" that has made India the loyal contented state of the Empire that she to-day is. Probably not one of the first fifty men you pass in the street could tell you who Sir Richard Meade was, but throughout Central and Southern India thousands hold his name and memory in love and affectionate esteem. Mr. Thornton's biography is a well-told story of well-done work.

Reflections on the Art of War. By Brig.-General R. C. HART, V.C., C.B., R.E. 2nd Edition. London: Clowes and Sons, 13, Charing Cross. Price 7s. 6d. 1897.

Military men will be glad to welcome a second edition of this very readable work, the scope of which is best indicated by the following quotation from its preface:—"Many works on the Art of War appear to me to be extremely dry and uninteresting. The Art of War has its principles, and its rules based on those principles; but probably the best way to teach them is not to ask people to accept them as abstract facts; but rather to interest, to arrest attention and encourage study, by giving examples from history to illustrate each rule and principle." This advice appears essentially practical considering the stage of evolution of military thought which has been arrived at in England at present. It is to be regretted that this stage should still be so very elementary in this country, whereas in Germany it has shot far ahead, not specially through the labours of any one particular writer, but through the accumulation of a mass of practical experiences and their sifting by men of all orders of talent, until conclusions and principles about which we still generalise vaguely have been brought down within such well-defined limits that they can be dealt with and handled, with the same precision with which our civil engineers treat such subjects as the strength of materials. They do not yet know, and probably never will be able to explain, with accuracy, precisely what happens amongst the molecules of a bar of iron when a current of electricity passes, or how these molecules comport themselves as a heavy express thunders over the metals; but they have established certain working rules and formulæ which suffice in 999 cases out of 1,000, and that is sufficient basis on which to rear their marvellous structures.

Within similar though less-defined limits the German staff have reduced many of the most important problems of warfare, and the question is, Why should not we succeed in like manner? A part of the answer may be gleaned from the book now under review.

Until 1870 the study of the military sciences was always and everywhere individual, never collective; the subjects involved were not considered of general interest, and accurate discussion was out of the question. Hence our officers read what they pleased or had easiest access to, and had no means of checking the accuracy of their facts or the logic of their conclusions. French was the most accessible language, and French records were accepted as sufficient evidence, without comparison with other stories, with results which have often led to most disastrous consequences, and from which General Hart's work is not altogether free.

For instance, take the chapter headed "The Fortune of War." Nearly every instance given of the interference of unforeseeable chance relates either to a captured or undelivered order, and is based generally on French statements. Yet, if each incident is closely analysed, it will be found that chance had very little to say to the matter at all, the real culprit being the genius of disorganisation which existed throughout the French general staff, and the ultimate cause of which was the Emperor's demon energy and his desire to centralise everything into his own power.

Had the French staff been more efficient, "a brawl in a wayside inn" would never have occurred, and the Emperor's despatches to Soult would never have come into Sir John Moore's hands.

In 1812-13-14 and 15 (p. 87), fortune is said to have turned against the Emperor. But was it fortune? Close analysis has long since convinced the German experts that the true causes of all the many disasters of those terrible years were the certain and inevitable consequences of the seed he had himself sown when during his first campaigns in Italy he stirred up the basest passions of his soldiers for plunder and self-aggrandisement, when with the growing weight of public affairs on his shoulders he neglected the organisation and training of his staff and his marshals.

Chance there must always be in war, as there is in the breaking of a steel rail under a load it has carried year in year out without sign of deterioration; but careful analysis and a well-trained staff can reduce the limits within which chance can act, and provide against almost every contingency except the sudden failure of the master intellect, through illness, death, or other accident.

The above criticism will, perhaps, suffice to set other minds on the critical track, and show them how to derive most profit from their study. In doing so it is believed that benefit will accrue to the cause, which no one has more at heart than General Hart himself, viz., the spread of sound knowledge and good education throughout all branches and ranks of the Service. The careful study and analysis of a work like this, as opposed to its mere perusal, will do more to form the judgment and character of the young officer than the cramming of a multitude of text-books.

Egypt in 1898. By G. W. STEEVENS. London, 1898.

"Egypt in 1898" is a series of letters written in the early half of the current year, and now collected in book form. It is a matter for regret, both for the sake of the author and his readers, that the production of this book was not delayed until after September, when the decisive battle of Omdurman would have afforded material to render the book more historically complete. In the light of subsequent events, the fact that the Sirdar is but referred to once only, tempts us to complain that "Hamlet" has been produced with the omission of the character of that famous Prince of Denmark. In spite of this deficiency it is no small praise to Mr. Steevens to say that all classes of readers will find much to interest them in these 283 pages. The *blasé* globe-trotter will learn with surprise that there is still something original to be said about so ordinary a matter as a voyage on a P. and O. steamer; the enthusiastic Imperialist will read criticisms on his countrymen abroad, which if not always judicious are always complimentary, and the happy audacity which enables the author to solve subtle questions of international relationship will excite envy in the minds of those in high places. Two questions in particular touched upon by Mr. Steevens are of great importance – the management of the Suez Canal, and the construction of reservoirs on the Nile. On the former question the directors are fearlessly impeached; among the charges brought against them by the author, the promise of doubling the width of the Canal, which has never been fulfilled, being one which merits serious attention. With regard to the reservoirs, Mr. Steevens points out that, thanks to the barrage having been so thoroughly repaired since our occupation in Egypt, the output of the cotton-crop has increased from under three to six million hundred-weight annually. That dam, in fact, has doubled the yield of the province; and what the barrage has done for Lower Egypt, the new reservoir at Assouan will do for Upper Egypt, and not only that, but it will probably also banish the spectre of famine from the land. Those who read Mr. Steevens' book will learn that, although much has been effected for the benefit of Egypt during the last few years, yet a vast amount still remains to be done.

Forty-one Years in India. By Field-Marshal Lord ROBERTS. New Edition in one volume, 8vo. Macmillan & Co. London, 1898. Price 10s.

All interested in India, and all military men in particular, will welcome the appearance of the cheap edition of Lord Roberts' "Forty-one Years in India," which Messrs. Macmillan have lately published. The work itself is now so well known and recognised as one of the standard works on India, that it is not necessary to say more about it in this present notice, which is only intended to draw attention to the capital form in which the new edition has been brought out by the publishers. The book is well bound, the type good, and there are numerous portraits, maps, etc., and undoubtedly it is well worth the price at which it is now offered.

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